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TRAFFIC SURVEY

GREAT FALLS

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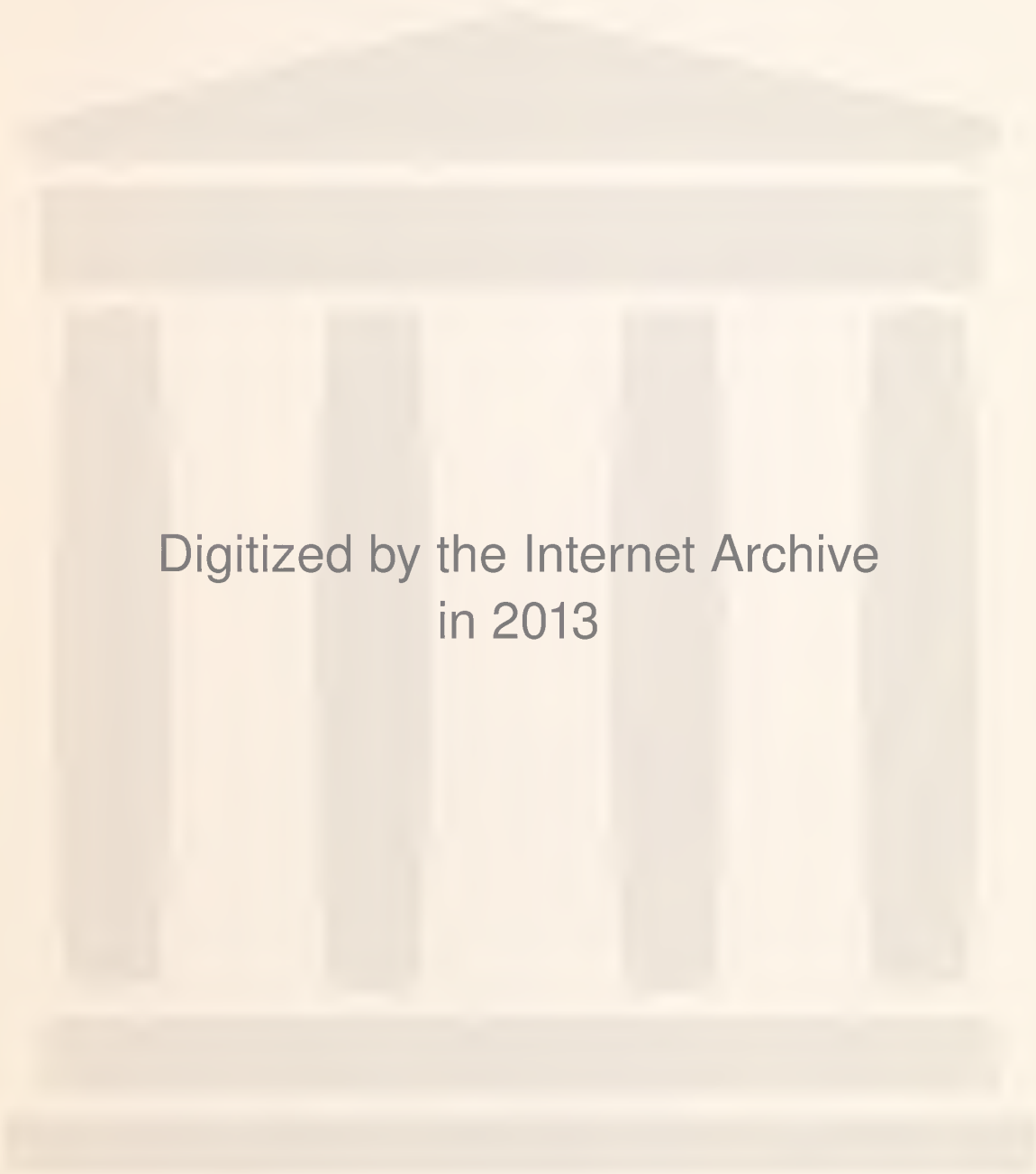
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AERIAL VIEW OF CENTRAL BUSINESS DISTRICT

URBAN AREA TRAFFIC SURVEY
GREAT FALLS, MONTANA

CONDUCTED BY THE

MONTANA HIGHWAY COMMISSION

PLANNING SURVEY

AND

THE CITY OF GREAT FALLS

IN COOPERATION WITH

U. S. DEPARTMENT OF COMMERCE

BUREAU OF PUBLIC ROADS

1953

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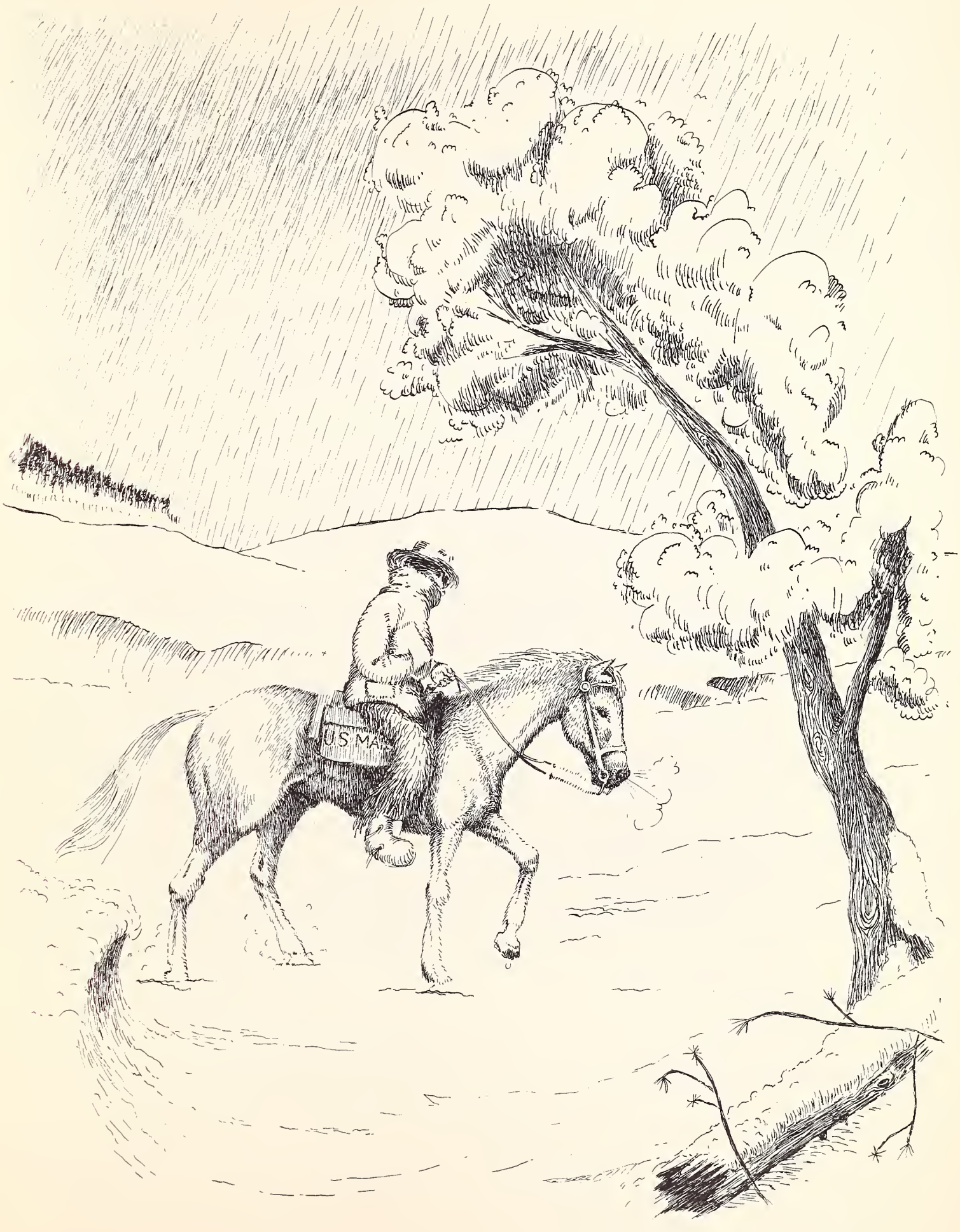
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A C K N O W L E D G E M E N T S

The assistance given by Mayor Austin and all Great Falls City Officials, the City Traffic Commission, the Great Falls Tribune, and thousands of motorists who were interviewed is gratefully acknowledged.

Our appreciation is also extended to the technicians from the Bureau of Public Roads and to Mr. R. E. Dunn, Assistant Traffic Engineer, of the Washington Highway Department. Their assistance in a consulting capacity has proven invaluable.

The following standard publications, as well as many other published reports by the Bureau of Public Roads and other State Highway Departments were used in the preparation of this report.

TRAFFIC ENGINEERING HANDBOOK, Second Edition, Henry K. Evans, Editor. A joint publication of the Institute of Traffic Engineers and the Association of Casualty and Surety Companies, New York, New York, 1950.

HIGHWAY CAPACITY MANUAL, prepared by the Committee on Highway Capacity, Department of Traffic and Operations, Highway Research Board, Washington, D. C., 1950.

PARKING STUDY MANUAL, Department of Commerce, Bureau of Public Roads, Revised Edition, 1953.

STATE OF MONTANA
HIGHWAY COMMISSION
HELENA

March 1, 1954

The Honorable James B. Austin, Mayor
and
Members of the Traffic Commission
Great Falls, Montana

Gentlemen:

We are happy to present you with this report on the Great Falls Traffic Survey conducted during June and July of 1953, as a cooperative project with the Bureau of Public Roads and the City of Great Falls.

This report is submitted in the hope it will provide sufficient factual data to permit action to alleviate some of the traffic congestion now existing. The need for facts is recognized in the solution of traffic problems which are complex and have such great impact on all segments of society.

This report marks a milestone in the progress of Montana, as it is the first study of internal city traffic in this State. It was a pleasure to have the City of Great Falls as a partner in the project, and the cooperation of all its officials and employees has been beyond expectation.

The interest of the Highway Commission will continue beyond the submission of this report. We sincerely hope the findings will be helpful in the solution of your traffic problem, and we stand ready to assist in any way possible in the formulation of a corrective program.

Respectfully submitted,

Scott P. Hart
State Highway Engineer

SPH:mb

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DEFINITIONS

ORIGIN AND DESTINATION STUDY. A study of the origins and destinations of trips made by vehicles passing out of, into, or through a selected area.

EXTERNAL ORIGIN AND DESTINATION STUDY. That part of an origin and destination study conducted usually by roadside interviews on main highways entering a certain area or city.

INTERNAL ORIGIN AND DESTINATION STUDY. That part of an origin and destination study usually conducted by interviewing motorists entering or leaving the central business district of a city.

CENTRAL BUSINESS DISTRICT. The major business district of a city, also commonly called the downtown area.

CORDON LINE. A line used to define and bound a certain area. In this study the area bounded by the cordon line was the central business district.

CORDON COUNT. A count of all vehicles entering and leaving a certain area (central business district) during a specified length of time.

TRAFFIC PATTERN. A tabular or graphical presentation of the fluctuation of traffic over a specified period of time.

TRIP. The one-way travel of one vehicle between an origin and destination.

DESIRE LINE. A straight line between a point of origin and a point of destination without regard to existing routes.

SPACE HOUR. One parking space used for one hour. A term used to measure parking supply and demand on a comparable basis.

PARKING DEMAND. Total need for parking space as determined by the expressed origins and destinations of drivers.

PEAK HOUR OF ACCUMULATION. The hour during which there is the maximum accumulation of vehicles within the survey area.

PARKING TURNOVER. The number of vehicles using one parking space during a specified length of time.

DESIGN VOLUME. A traffic volume determined for use in design representing traffic expected to use the facility. Unless otherwise stated, it is an hourly volume roughly corresponding to the 30th maximum hour for the year.

POSSIBLE CAPACITY. The maximum number of vehicles that can actually be accommodated by an intersection approach under prevailing conditions with a continual backlog of waiting vehicles.

PRACTICAL CAPACITY. The maximum number of vehicles that can enter an intersection from any approach with most of the drivers being able to clear the intersection without waiting for more than one complete signal cycle.

SURVEY HIGHLIGHTS

The average daily traffic entering, leaving, and passing through the central business district in June, 1953, totaled 98,443 vehicles, or 79,423 one-way trips between point of origin and point of destination. Of this number 31,534 drivers were interviewed.

60,403 trips, or 76%, had either an origin or destination within the inner cordon or central business district. The remaining 19,020 trips could theoretically by-pass the business district on their way to other zones or to points outside the metropolitan area.

The maximum accumulation of vehicles within the inner cordon area occurred between 10 and 11 A.M. on both weekdays and Saturday. However, more vehicles were parked within the area on Friday (3,285) than on Saturday (3,097) during the peak hour of accumulation.

668 vehicles were parked in alleys, service stations, and other informal parking areas during the peak hour on Friday, and 647 vehicles were parked in these same areas on Saturday.

There were 3,888 parking spaces available within the cordon area consisting of 1,121 meters, 917 at unrestricted curb, 1,650 in parking lots, and 200 in garages. During the peak hour on Friday, all formal spaces were filled to 67% of capacity, and there were fifteen blocks in the critical downtown area where more vehicles were parked at the curb than there were legal spaces available.

During the hours of 10A.M. to 6 P.M., 58% of the parking was for the purpose of work or business, 16% for shopping, 6% to eat meals, 12% social or recreational, 1% medical or dental, and 7% for other purposes.

39% of the curb parking was for 15 minutes or less, and 82% was for 1 hour or less. Only 18% of the total vehicles parked for over 1 hour, but they used 48% of the available space hours at the curb.

The average length of time parked, both curb and off-street, for work or business was 1 hour 47 minutes, shopping 41 minutes, eat meal 1 hour 18 minutes, social or recreational 1 hour 23 minutes, medical or dental 1 hour 17 minutes, and other purposes 1 hour 58 minutes. The average time parked for all purposes (curb and off-street) was 1 hour 33 minutes.

Central Avenue is operating above practical traffic capacity due primarily to the present use of angle parking. This practice reduces the traffic carrying capacity of the avenue by approximately 40%.

Actual travel time on Central Avenue between Park Drive and Ninth Street during the peak hour (4:30 to 5:30 P.M.) was only 57% of the total running time. Intersection delay accounted for 36% of the total running time, and mid-block delays accounted for 7%. Average over-all speed during the peak hour was 6.9 miles per hour west bound and 7.8 miles per hour east bound.

RECOMMENDATIONS

CENTRAL AVENUE

Immediate consideration should be given to changing from angle to parallel parking on Central Avenue and establishing four eleven-foot traffic lanes and two eight-foot parking lanes from Park Drive to Ninth Street. This change will increase the traffic capacity of the avenue by approximately 60% and should show a corresponding decrease in traffic delays and accidents caused by parking maneuvers. After parallel parking has been established, the existing traffic signals should be timed according to the time-space diagram shown on Plate 48. This proposed timing will not increase the traffic capacity, but it will enable progressive movement, which is lacking at the present time. When progressive movement is attained, traffic accidents of the "rear end collision" type should also decrease due to the decrease in unnecessary stops and starts.

Research studies have indicated that the proper striping of center and lane lines on an urban facility has the following important advantages:

1. Vehicles are driven closer to their proper position on the street.
2. More effective use is made of the available street width.
3. Congestion at intersections is reduced and average traffic speeds are increased.

It is therefore recommended that Central Avenue from Ninth Street to Park Drive be striped according to the suggested layout shown on Plate 3. If the city does not own a striping machine at the present time, the purchase and use of such a machine on all main arterials is strongly recommended.

PARKING

The proposed change from angle parking to parallel parking on Central Avenue will mean the immediate loss of approximately 125 curb parking spaces, and during the peak hour of parking it was found that in a critical 15 block area there were 65 more vehicles parked than there were legal curb spaces available. We therefore recommend that immediate consideration be given to providing off-street parking space for at least 200 vehicles within this area. It must be emphasized that 200 spaces will only provide for immediate needs. Any long-range parking program must recognize

the fact that present conditions indicate 1970 vehicle registrations will have increased by 41% and population by 24%. If Great Falls is to enjoy future growth and progress, it will therefore be mandatory to provide additional parking space as needed in anticipation of future growth.

More efficient use can be made of the existing curb parking facilities by adopting the following suggestions:

1. Stricter enforcement of one-hour parking restrictions now in effect in the downtown area. Vehicles were found parked for 8 hours at one-hour meters on Central Avenue with a considerable portion of the time in meter violation. To discourage this practice, enforcement must be positive, continuous, and impartial.
2. That merchants and employees in the critical parking area be encouraged to park their cars in lots or at the fringe of the business district, thus leaving additional spaces for customer parking.
3. That consideration be given to installing more 12-minute or one-half hour meters in certain blocks where the parking demand is greatest.

ONE-WAY STREETS

Reports from cities where one-way streets have been in operation for several years indicate that there are several important advantages in their use.

1. Intersectional type accidents are substantially reduced because the number of conflicts between traffic streams of intersecting one-way and two-way streets are reduced to one-third that of two intersecting two-way streets.
2. Travel speeds are improved as there is no opposing traffic, and progressively timed signals are easily established.
3. The traffic capacity of an existing facility can be increased substantially with no expenditure required for major improvements.
4. Parking may be permitted on a street that is too narrow for parking and two-way operation.

Some of the principal disadvantages of one-way streets are:

1. Motorists may have to travel farther in reaching certain destinations.
2. Considerable additional sign posting is required.
3. Some business establishments abutting on one-way streets may be adversely affected, due to the loss of traffic in one direction.

The advantages of one-way operation in Great Falls greatly outweigh the disadvantages, however, and it is therefore recommended that First and Second Avenues North be placed in one-way operation from Park Drive to Fifteenth Street, according to either of the plans on Plate 1. A much smoother transition from one-way to two-way traffic can be achieved by providing a diagonal through Morony Park. If right-of-way considerations prohibit street construction through the park, the alternate plan extending the one-way operation to Fifteenth Street should be adopted.

First Avenue North is now operating above practical capacity from Park Drive to Fourth Street. Second Avenue North is operating above practical capacity from Ninth Street to Fifteenth Street and would be above capacity from Park Drive to Ninth Street if parking on both sides was permitted. One-way operation on each of these avenues would approximately double their present capacity besides smoothing out and speeding up the flow.

Progressively timed signals can then be established which would further eliminate delays and improve travel speed. After one-way operation is put into effect, parallel parking can be permitted again on the south side of Second Avenue North from Ninth Street to Park Drive, thus gaining at least 80 badly needed parking spaces. If the present two-way system is retained, it will be necessary to widen Second Avenue North or prohibit parking from Ninth to Fifteenth Streets to gain the required capacity.

ARTERIAL STREETS

The internal origin and destination survey shows a heavy volume of trips that have an origin or destination south of Central Avenue and east of the central business district. This traffic is not too adequately served at present because the two main east-west arterials in this area, Central Avenue and Tenth Avenue South, are located ten blocks, or 4,000 feet, apart. Approved practice recommends that major arterials be spaced at approximately two-thousand-foot intervals unless

exceptional conditions make closer spacing necessary.

To facilitate the orderly movement of this heavy east-west volume of traffic, it is recommended that Fourth Avenue South be developed as a major east-west arterial from the east city limits to Fifth Street. Preferential treatment regarding stop signs or signals should be given this avenue at all intersections with the exception of Fifth, Ninth, and Fifteenth Streets.

The origin and destination survey also points out the need for an additional arterial between Ninth and Second Streets to handle the heavy north-south traffic volume feeding into the business district from the south. Consideration should therefore be given to developing Fifth Street as a north-south arterial from Tenth Avenue South to Central Avenue.

Tenth Avenue South serves a heavy volume of east-west traffic and will be reaching its practical capacity as a two-lane facility in the near future. We therefore recommend that Tenth Avenue South be reconstructed to a four-lane standard from Fifth Street to a junction with U.S. 87 and 89 east of Great Falls.

LONG RANGE PROGRAM

Fifteenth Street

Ninth Street was signed and placed in operation as a connecting link between U.S. 87 North and U.S. 87 and 89 South in 1952. Due to the impracticability of reconstructing the two railroad grade separation structures and the bridge on the north, it can only be regarded as a temporary route to carry the traffic through the city until such time as the bridge across the Missouri River at Fifteenth Street can be reconstructed to a standard that will carry heavy loads. It is recommended that a new bridge be constructed at this location, and that Fifteenth Street be improved and designated as U.S. 87 and 89 from Tenth Avenue South to Second Avenue North and as U.S. 87 from Second Avenue North to a junction with present U.S. 87 north of Black Eagle.

First Avenue North Viaduct

Traffic through the First Avenue North viaduct was observed to be averaging approximately 18,000 vehicles per day during June and July of 1953. The present structure is a definite bottleneck because of its location at the end of the four-lane Missouri River bridge and its inadequate horizontal and vertical clearances. The four lanes on the First Avenue North bridge are reduced to two under the via-

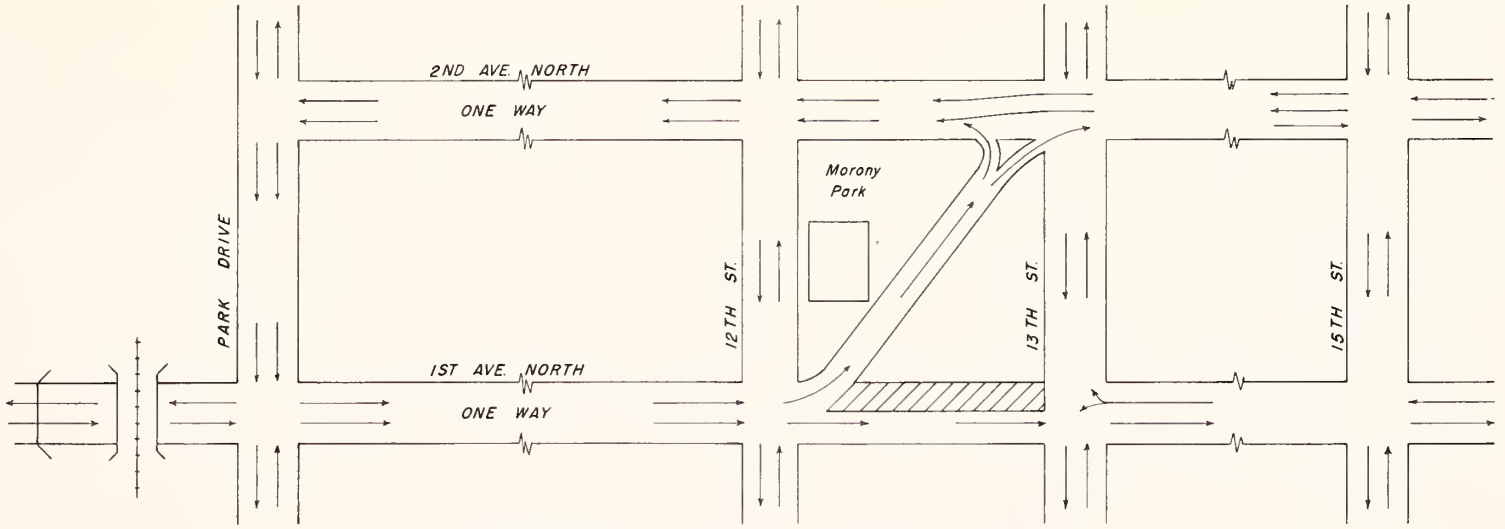
duct due to the center pier and limited horizontal clearance. It is therefore recommended that this structure be replaced with one that is adequate to take care of all traffic needs in the foreseeable future.

Truck Routes

Great Falls is now provided with by-passes on the south and west which facilitate the movement of through trips around the city. Some consideration should be given in the future, however, to providing access from Tenth Avenue South to the industrial area situated along the railroads and the Missouri River near the north city limits. Fifteenth Street seems the logical route to provide such access and after the reconstruction of the Missouri River bridge on the north end, it is recommended that it be developed as a major north-south truck route.

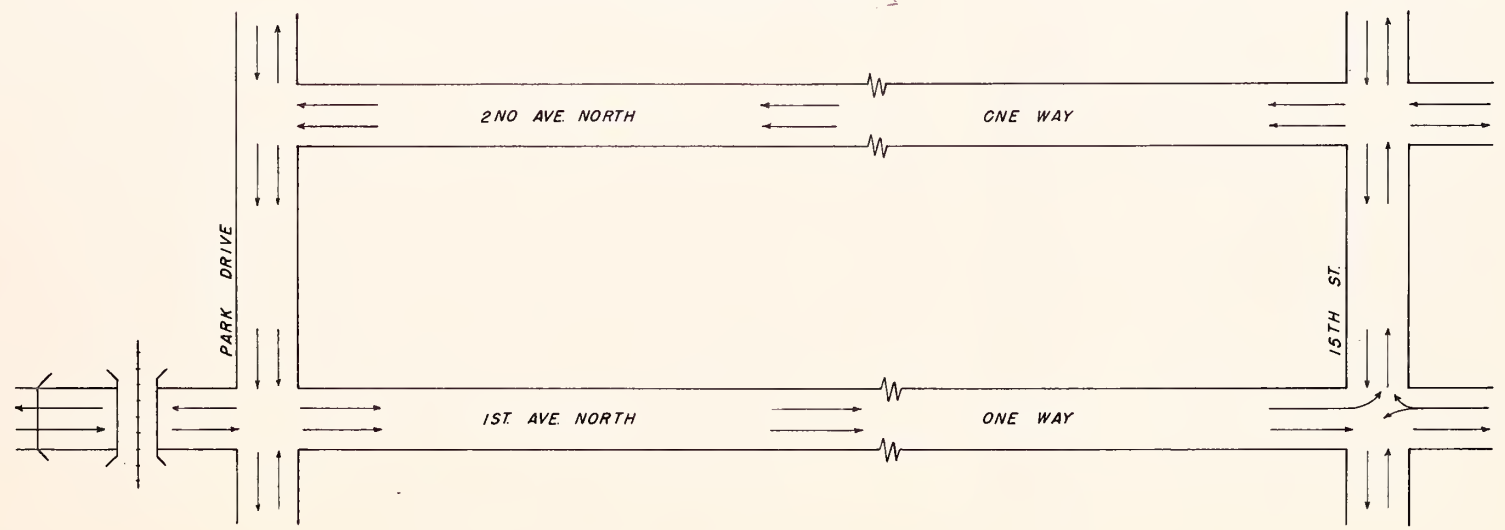
Additional observations and suggestions which are considered outside the scope of a traffic survey are contained in the addenda to this report.

PLATE I



PROPOSED ONE WAY STREET LAYOUT

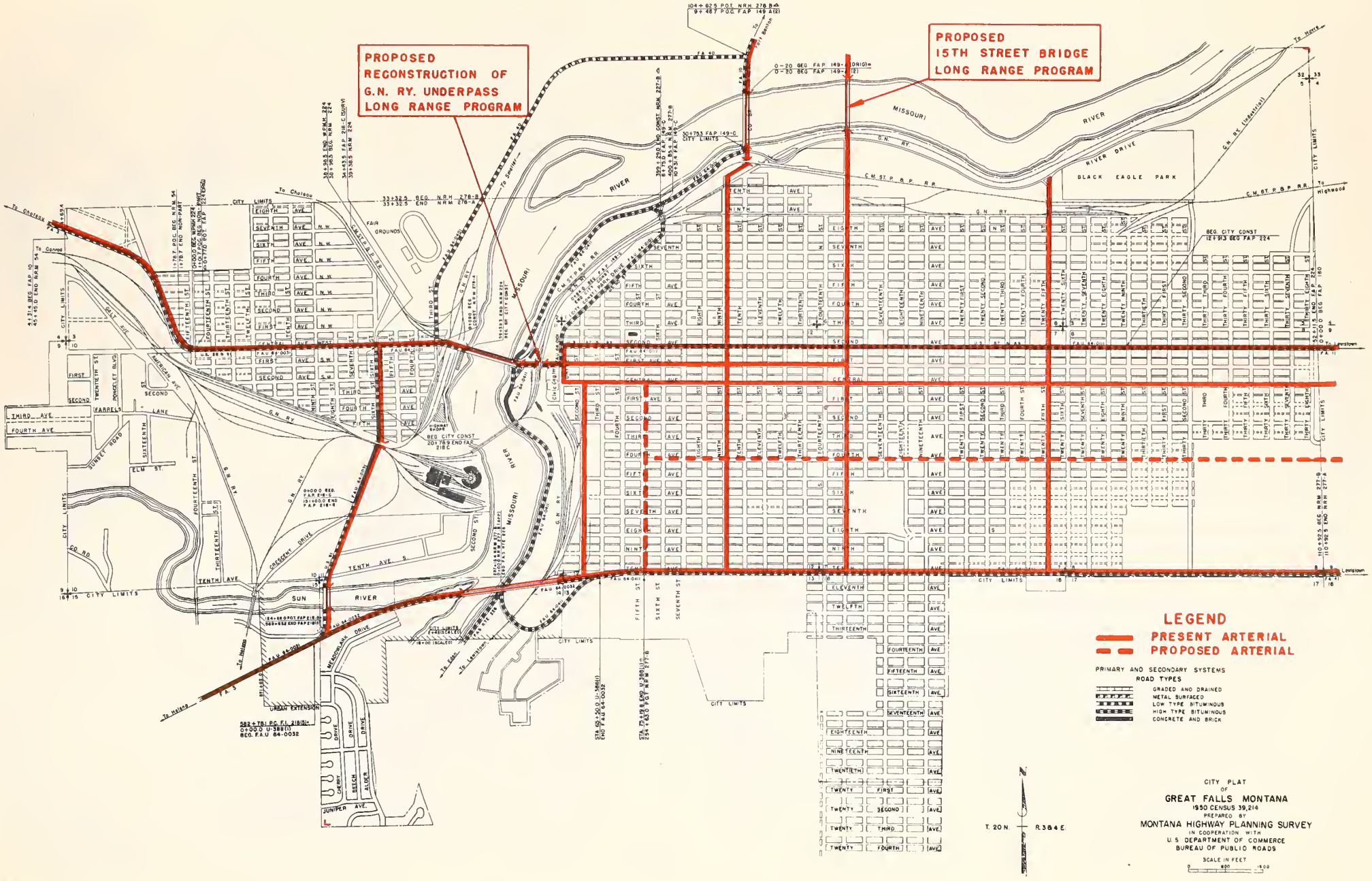
ALTERNATE PLAN



GREAT FALLS TRAFFIC SURVEY

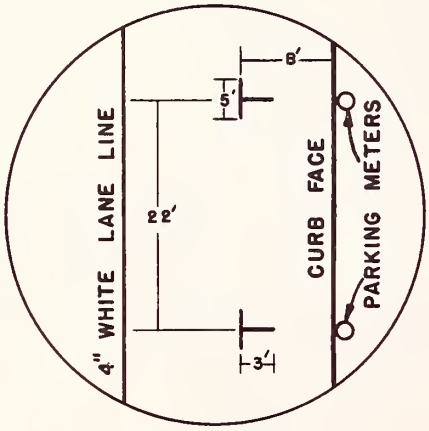
ONE WAY STREETS

PLATE 2

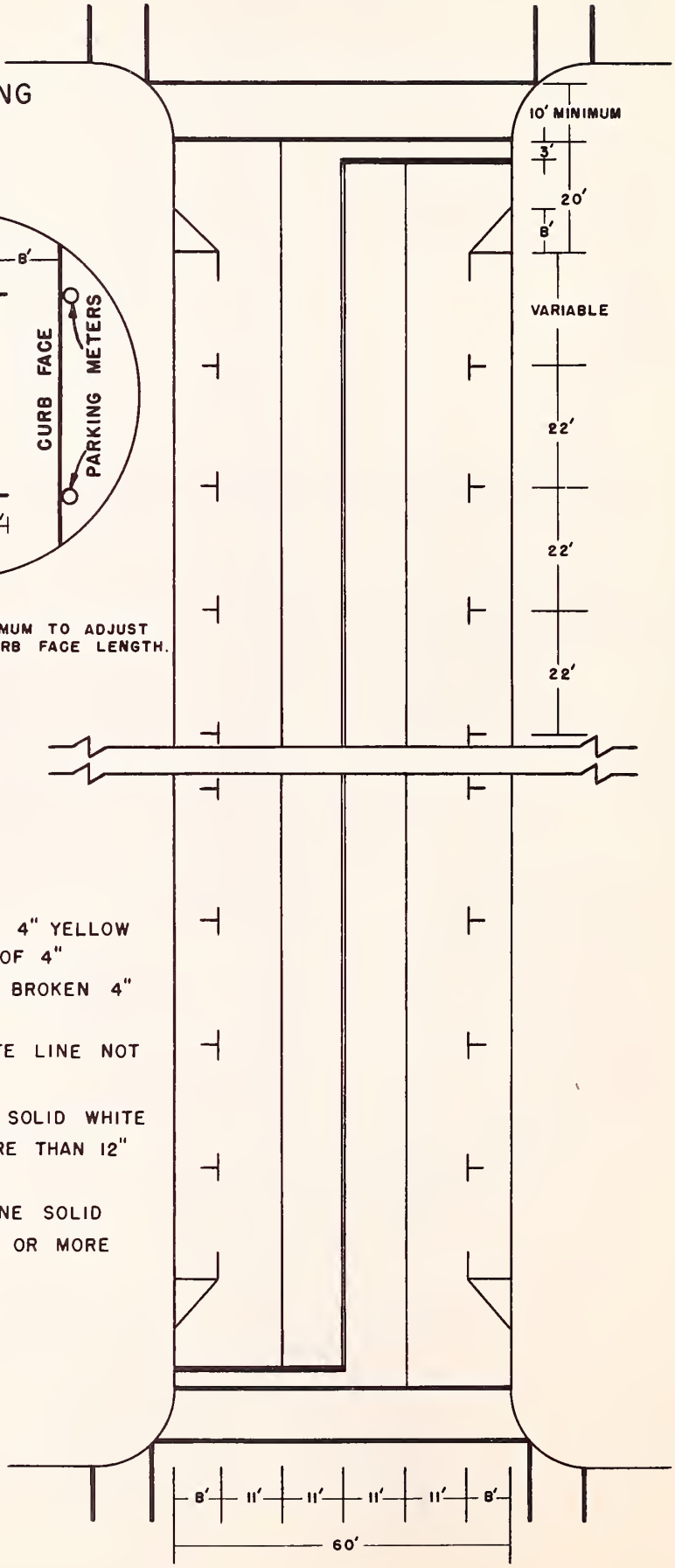

PROPOSED
RECONSTRUCTION OF
G.N. RY. UNDERPASS
LONG RANGE PROGRAM
PROPOSED
15TH STREET BRIDGE
LONG RANGE PROGRAM
MISSOURI
RIVER
G.N. RY.
C.M. ST P. & P. RR.
BLACK EAGLE PARK
RIVER DRIVE
FAIR GROUNDS
SUN
RIVER
CITY LIMITS
To Great Falls
To Havre
To Helena
To Lewistown
To Chateau
To Conrad
To Highwood
To Simms
To Vaughn
To Belt
To Sand Coulee
To Stockett
To Monarch
To Geyser
To Lewistown
LEGEND
PRESENT ARTERIAL
PROPOSED ARTERIAL
PRIMARY AND SECONDARY SYSTEMS
ROAD TYPES
GRADED AND DRAINED
METAL SURFACED
LOW TYPE BITUMINOUS
HIGH TYPE BITUMINOUS
CONCRETE AND BRICK
CITY PLAT
OF
GREAT FALLS MONTANA
1950 CENSUS 39,214
PREPARED BY
MONTANA HIGHWAY PLANNING SURVEY
IN COOPERATION WITH
U.S. DEPARTMENT OF COMMERCE
BUREAU OF PUBLIC ROADS
SCALE IN FEET
0 600 1200
T. 20 N.
R. 3 & 4 E.

RECOMMENDED
PAVEMENT MARKING LAYOUT
FOR FOUR LANE ARTERIAL

DETAIL OF "T" TYPE PARALLEL CURB PARKING STALL MARKING



END STALLS VARIABLE FROM 17' MINIMUM TO ADJUST NUMBER OF STALLS TO AVAILABLE CURB FACE LENGTH.



PAVEMENT MARKING SPECIFICATIONS

CENTER LINE: TWO SOLID 4" YELLOW LINES SEPARATED BY A SPACE OF 4"

LANE LINE: ONE SOLID OR BROKEN 4" WHITE LINE.

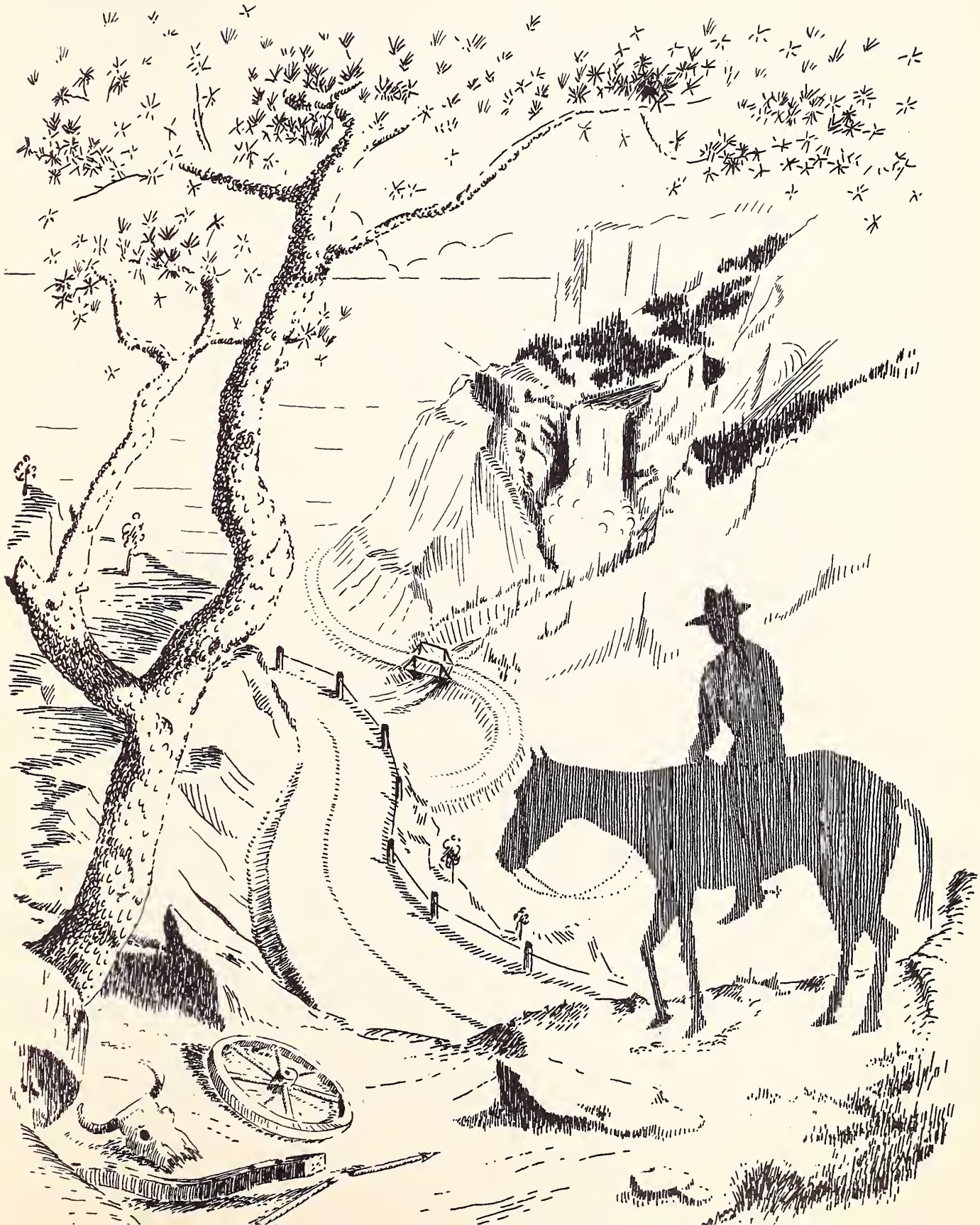
STOP LINE: ONE SOLID WHITE LINE NOT LESS THAN 12" WIDE.

CROSS WALK LINE: ONE SOLID WHITE LINE NOT LESS THAN 4" OR MORE THAN 12" WIDE.

PARKING STALL LINE: ONE SOLID WHITE LINE NOT LESS THAN 4" OR MORE THAN 6" WIDE.

PLATE 3

Introduction



INTRODUCTION

LOCATION

Great Falls, with a 1950 population of 39,214, is the largest city in Montana. The population of the city and environs was reported as 45,727 in the 1950 census. The city is located at the confluence of the Sun River and the Missouri River in the northern half of Cascade County, of which it is the county seat. The Missouri River divides the city into two sections. The east section contains the main business district and is the principal part of the city. The west section contains the Fair Grounds, a commercial district, a residential district, and several industrial establishments, including the division shops of the Great Northern Railway. There are four highway bridges crossing the river and two railroad bridges.

The east section of the city rises on a rather gentle slope from the river to the plain from which the river channel was cut. The west section is located between the two rivers and is predominantly flat. The city is laid out in the grid pattern with moderately wide streets, numerous parks, and boulevard strips between the streets and residence property.

HISTORY

Paradoxically, the falls of the Missouri River, from which the city derives its name, and which have contributed much to the economic development of the city, were actually a deterent to the early development of the city because of the barrier which they presented to the early modes of travel.

Although occasional trappers had ventured into the territory known as Montana, the initial exploration by the white man is credited to Captains Meriwether Lewis and William Clark, who led an expedition to explore the lands recently acquired under the Louisiana Purchase. For the early traveler, the waterways were the highways, and it was natural for the Lewis and Clark Expedition to choose a route up the Missouri River from St. Louis. Their supplies were loaded in pirogues which were poled and towed up the river. The party entered Montana in the spring of 1805 and camped near the falls on July 4, 1805. In order to get around the falls, it was necessary to portage boats and supplies to continue the water journey to the headwaters of the river.

Within a few years after the Lewis and Clark Expedition, the fur trade gained

prominence and was the principal economic feature in the region until the 1840's. The fur trade also followed the river, and trading posts, or forts, were built at strategic points along the river. The closest post to the present site of Great Falls was Fort McKenzie, which was built in 1831 at a point below Fort Benton. Fort Benton itself was established in 1846 at a point about 40 miles downstream from Great Falls.

The movement of furs to St. Louis and trade goods back from St. Louis was dependent almost entirely on river boat traffic. It was a long and tedious journey for hand-powered boats, but the profits were rewarding.

A new stimulus to river traffic resulted when gold was discovered in Montana in the late 1850's. Placer mining, and later lode mining, replaced the fur trade as the principal economic pursuit in the State. Whereas the white population of the State was previously composed of trappers, traders, missionaries, and explorers, the 1860's witnessed an influx of pioneers, prospectors, miners, and immigrants bound for the Oregon territory. The steamboat replaced the hand-powered boats, and they did a tremendous business. It is reported that over 10,000 passengers were unloaded at Fort Benton in 1867. One boat returning to St. Louis carried over one and a quarter million dollars in gold dust.

Under the direction of Lt. John Mullan, a military road was built from Fort Benton to Walla Walla, Washington, during the period from 1859 to 1863. The road extended southwestward from Fort Benton, at considerable distance from the river, crossed the Continental Divide west of Helena, and continued westward through the present alignment of U.S. Highway No. 10. Although the road was built primarily for the convenience of immigrants to the Oregon Territory, it opened up much new country in Montana.

During the period of early development in the State, there was little to indicate that a city would some day be built in the vicinity of the Great Falls of the Missouri River. The very existence of the falls discouraged the traveler from coming that way. Boat traffic had to portage around the Falls. Steamboats stopped at Fort Benton, the most favorable terminus below the falls. The rough terrain along the river was unsuited for foot, horse, or wagon traffic, so an easier route to the north was followed. As a result, the country in the vicinity of the falls remained undeveloped until about 1882.

Paris Gibson, the founder of the city, settled in the vicinity that year. The nearby coal fields, undeveloped water power, the era of mechanization, the coming of

the railroad--the combination of these factors indicated a bright industrial future for the area. In anticipation of future developments, Paris Gibson and James J. Hill, of Great Northern Railway fame, acquired large holdings in the vicinity. The original townsite was surveyed and platted in 1883. In contrast to many of the earlier cities in Montana, the layouts of which were based on topographical restrictions, with unplanned and unrelated developments, the details of Great Falls were planned from the beginning. The city was laid out on the grid system, with moderately wide streets, ample provision for public parks, and other features which give the city its modern appearance.

By 1887 the city had reached an estimated population of 1,200. It was incorporated as a second class city on October 4, 1888. The Great Northern Railway reached the city on October 15, 1887, and was followed by the Chicago Milwaukee St. Paul & Pacific Railway on November 18, 1887. The Great Northern was later extended to the mining cities of Helena and Butte--an important consideration in the future construction of smelters near Great Falls.

The first smelter was built in 1888 at a point along the Missouri River a short distance downstream from the city. The first power dam was also built in the same general vicinity at Black Eagle Falls in 1891. The power was used to supply both the city and the smelter. The original smelter was later replaced by a much enlarged plant, an electrolytic copper refinery, a zinc refinery, and a rod and wire mill which produces copper rods and wire and, more recently, aluminum wire. The original power dam at Black Eagle Falls was rebuilt in later years, and the power output was greatly enlarged by the construction of larger plants at Rainbow, Ryan, and Moroney Dams. The abundance of hydro-electric power encouraged development of several industrial enterprises.

The growth of farming and stock raising in the vicinity has a less spectacular history. During the early days, farming and stock raising were confined largely to the western valleys near the mining centers, where there was a ready market for farm products. The unlimited grazing range east of the mountains later attracted large cattle companies who ruled the range for many years. The era of cattle raising reached its zenith in the 1880's, when competition for land from the homesteader and sheepman began to take effect. The greatest influx of homesteaders occurred after 1910, and much of the land around Great Falls was taken up during this period. The disastrous drought between 1917 and 1919 forced the abandonment of much of the poorer land. Some land was returned to grazing; much

of it lay idle. In later years, improved methods of cultivation demonstrated that such land could produce valuable crops with proper care and farming practices. At present there is very little land in this part of the State which is not utilized for farming or grazing.

POPULATION GROWTH

Plate 5 shows the population growth of Great Falls since 1890. Three principal periods of rapid growth may be noted:

1. From 1890 to 1900, following the entry of railroads.
2. From 1910 to 1920, a period of smelter and power dam develment and the influx of homesteaders to the general vicinity.
3. From 1940 to 1950, attributable to the influx of military personnel and dependents in connection with the establishment of the air base, and also attributable to the substantial commercial and industrial expansion which the city has experienced since the war.

Motor vehicle registrations are reported only for counties; consequently, Great Falls registrations cannot be segregated from those of Cascade County. However, about 75% of the population of Cascade County is located in Great Falls, so that the county registrations are also representative of the city registrations. The chart on Plate 5 shows the growth of motor vehicle registrations in Cascade County.

The rapid increase in motor vehicle registrations during recent years may be attributed to the increased population in Great Falls.

COMMERCE

Great Falls is the nucleus of a vast trading area which includes some of the most productive dry land, as well as irrigated, farms and ranches in the State. Wheat is the principal crop, but there is also extensive livestock production. In the irrigated areas beets, potatoes, peas, and many other vegetables are grown. Dairy cattle, poultry, sheep, and swine are also maintained in connection with the other agricultural pursuits. The diversity of farm production tends to stabilize the economy of the region during the periods of inadequate rainfall with consequent low yields of grain crops.

The farm trade from the general area is a very important factor to the economy

of the city, as is evidenced by the existence of numerous agricultural establishments such as implement dealers, creameries, elevators, equipment and farm supply stores, and other services of this nature. The department and other stores in the city also do a large part of their business with the rural resident.

The annual North Montana State Fair is held at the Fair Grounds in the west portion of the city. This is the largest event of the year and is one of the principal commercial assets of the city. It is supported wholeheartedly by all interests in the city and county.

One of the major livestock sales organizations in the northwest holds regular livestock sales near the Fair Grounds. A large meat packing company is also located at the eastern edge of the city. Because of its strategic location, many commercial organizations maintain headquarters in Great Falls to serve the surrounding areas.

INDUSTRY

The abundance of water power, coal in nearby fields, and good transportation facilities were among the original inducements to the location of heavy industry in the vicinity of Great Falls. Natural gas was discovered in the oil fields at the north end of the State, and it was soon piped to Great Falls. The conversion to gas for residential, commercial, and industrial uses, and the dieselization of the railroads has led to practical discontinuance of the coal-mining operations.

The principal industry is the smelting, refining, and wire and rod fabricating plant located north of the river and east of the suburb of Black Eagle. Impure copper and zinc products from other smelters are shipped to this plant for further refining. A portion of the copper output is fabricated into rods and wire. Aluminum wire has also been added recently to the production.

This plant constitutes the major payroll of the area. Other industries include the division shops of the Great Northern Railway, the four power dams on the Missouri River, large flour mills and grain elevators, oil refinery, iron foundry, machine shops, brewery, and numerous related industries.

TRANSPORTATION

Great Falls is served by the main line of the Great Northern Railway, with connections to Havre and Shelby, and also by branch lines extending to Helena and Butte, Lewistown, Billings, and intermediate points. The city is also served by branch lines of the Chicago Milwaukee St. Paul & Pacific Railway. Several large truck lines

also have terminals here.

One of the most modern airports in the State is located on Gore Hill, to the southwest of the city. Airline connections are provided to principal points within the State, other states, and in Canada. Runways are being extended for jet operations of the local National Guard squadron.

Great Falls is a highway transportation hub, with highways radiating in all directions. U.S. Highway No. 91, an Interstate System highway, extends southwestward through Helena and Butte towards Salt Lake City, and extends to the north to the principal cities in Alberta, Canada. U.S. Highway No. 87 extends to the southeast through Lewistown and Billings into Wyoming, and to the northeast to Havre. U.S. Highway No. 89 connects Great Falls with Glacier and Yellowstone National Parks and intermediate points. Western connections are provided by part of U.S. Highway No. 89 and State Route No. 20.

The highway pattern and natural barriers created by mountain ranges and the Missouri River make it necessary that most of the north-south traffic in the Central portion of the State pass through Great Falls. The same situation applies to some of the east-west cross-state traffic. At present, traffic from all of these highways is routed through the city, much of it in close proximity to the business district.

Great Falls is on a direct route for truck and passenger car traffic moving into Canada and Alaska via the Alaskan Highway. Of recent years this traffic has attained considerable importance, and all indications are that it will increase greatly in future years.

OTHER FEATURES

One of the factors which has contributed greatly to the growth of Great Falls during the last decade has been the construction and operation of a major air base at the east edge of the city. This base was built for bomber training during the war and, unlike many other wartime bases, it has retained its importance as a training and operational base.

The spending of the major portion of the military payroll in the city is reflected in the business prosperity of the city. The population of the city has been substantially increased by the military personnel and their dependents who reside off the base. The construction of facilities to house the off-base personnel has accounted for a large part of the postwar construction activity in the city.

Cultural features include a modern civic center with an auditorium and recrea-

tional facilities, a park system of 778 acres comprising 28 parks, modern office buildings and residences, and brightly lighted streets.

The foregoing presents an outline of the principal factors which have contributed to the growth of the city, the economic features pertaining to the city, and other characteristics which contribute to the generation, location, and flow of traffic. They are essential adjuncts to the study and analysis of the traffic problem as it exists in Great Falls today.

TRAFFIC PROBLEM

Prior to the war, Great Falls had the normal amount of traffic problems assoeiated with a city of its size. There was congestion in the central business district, but it was not critical. Although street parking facilities were crowded, a parking space could generally be obtained within reasonable walking distance of the destination. Several vacant lots were available for off-street parking--much of it free of charge. The Central Avenue West bridge, the principal artery connecting the two sections of the city, was carrying close to its practical capacity at rush hours, but plans were being formulated for a new bridge to relieve the congestion. In general, the traffic problem was evident but not acute.

The construction of the military air base near the east edge of the city was probably the first factor to enhance the traffic problem in the city and to disrupt the normal traffic pattern. The private cars of military personnel and the military vehicles added materially to the traffic volume on city streets. The location of the base was such that practically the entire traffic load between the base and the city followed Second Avenue North. This street was already carrying the through traffic from U.S. Highway No. 87-89 and the major portion of the east-west traffic in the city.

After the war and the abandonment of gasoline rationing, traffic throughout the State experienced a rapid increase. The normal traffic in cities also increased proportionately, and Great Falls began to realize some of the symptoms associated with growing pains.

The traffic connected with the air base continued undiminished. The postwar period of high farm prices and productivity added to the general prosperity of the trading area. This prosperity was reflected in increased demand for the farm supplies and equipment which were in short supply during the war. New commercial establishments and industries were created to meet the demand. These innovations, in

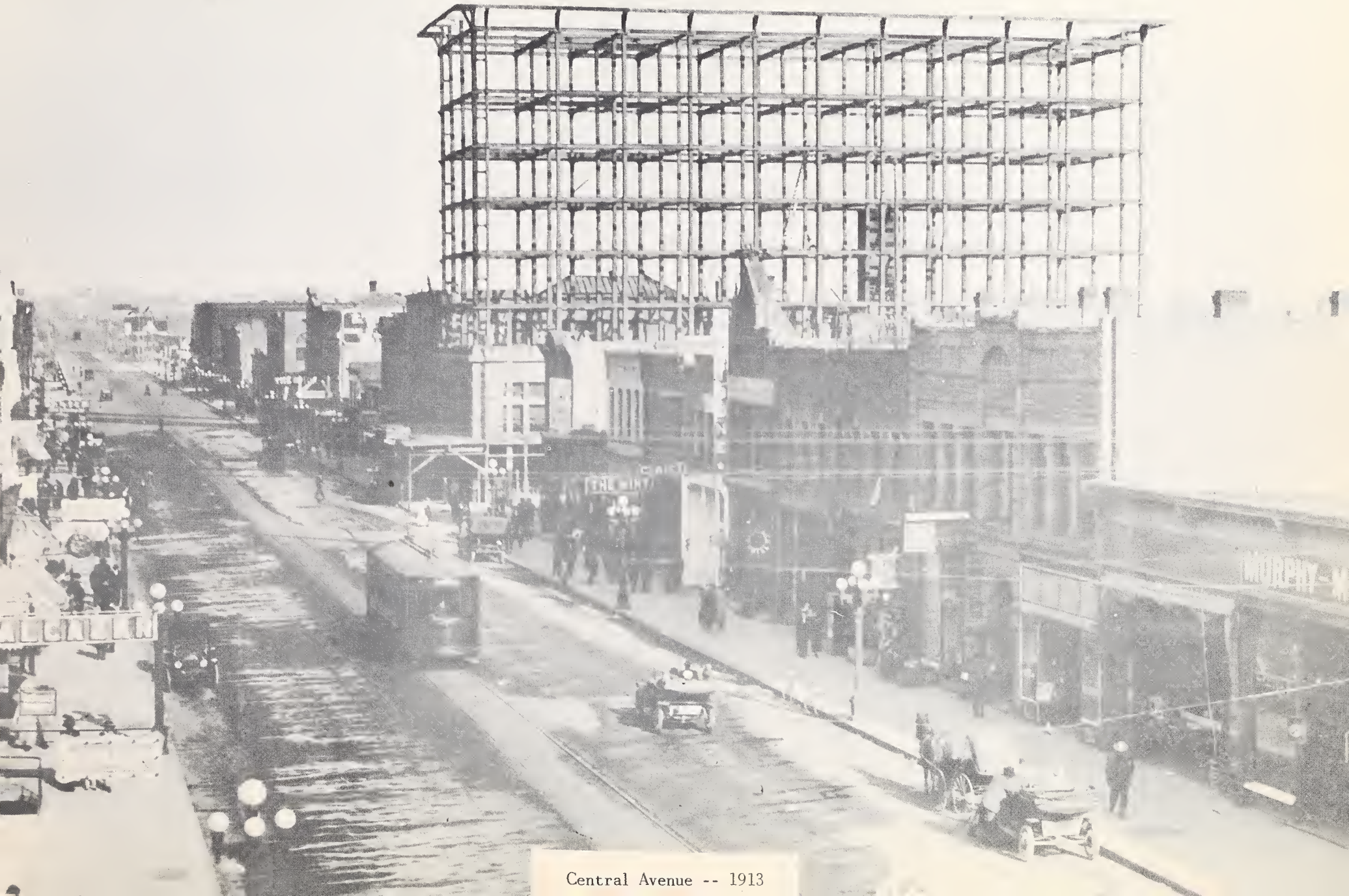
turn, attracted new residents to the city. The expansion in population, accompanied by the increase in motor vehicle numbers and usage, has created a state of congestion on the city streets which must be alleviated. Since most of the commercial growth has been concentrated in the central business district, the parking problem there has also been intensified. The parking problem has also been increased by the construction of buildings on lots previously used for parking purposes.

In the small town, business is generally proportionate to the amount of traffic on Main Street; consequently, there is an effort to route the traffic through the business district. In the large city, however, it is realized that the superfluous through traffic, by adding to the congestion in the business district, actually discourages the legitimate customer from shopping in the central district. As a result there is a definite trend to divert the through traffic to perimeter routes around the central business district. There is also a trend towards decentralization by building shopping centers in the outlying residential districts where accessibility and parking are unrestricted.

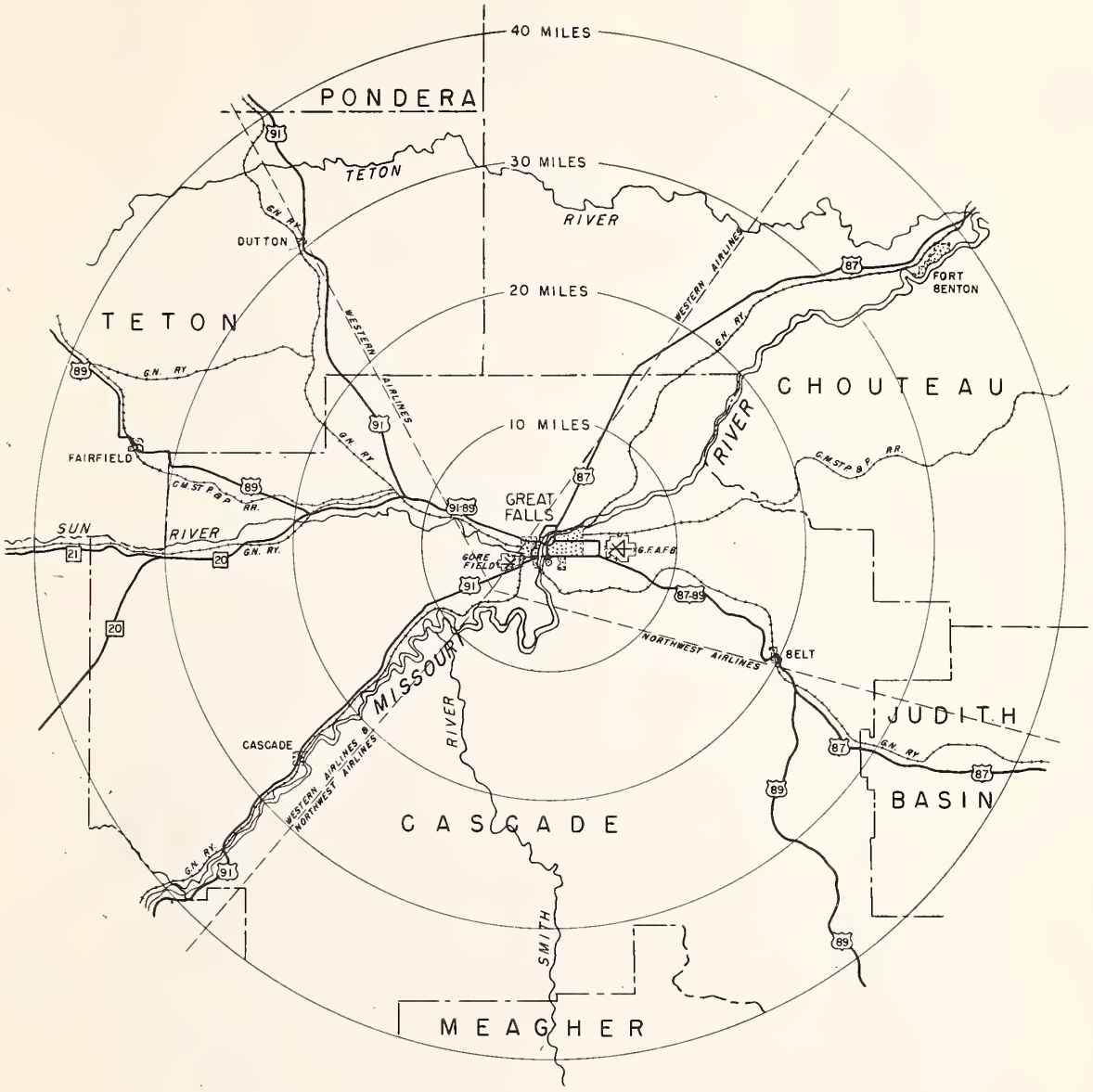
The first step in Great Falls which was taken to route the through traffic around town consisted of constructing a new bridge over the Missouri River in the vicinity of Tenth Avenue South. The bridge also opens a new avenue for traffic between the east and west sections of town.

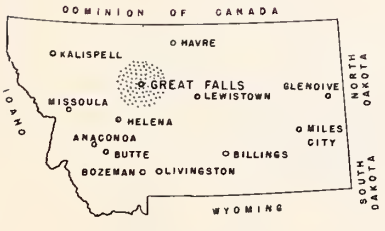
The new routing of through traffic permits the east-west traffic between U.S. Highways No. 87-89 and 91 to by-pass the city when desired. It does not, however, provide any relief from the through traffic between Lewistown and Havre, which follows U.S. Highways No. 87 and 89. To divert some of this traffic from the center of town, the city officials have suggested that a north-south urban route through the city be designated on Ninth Street from Tenth Avenue South to connect with the present Tenth Street bridge over the Missouri River.

It was realized that the diversion of through traffic was only one of the traffic problems confronting the city. consequently, the decision was made to investigate the entire traffic problem by taking external origin-destination surveys to determine the flow of through traffic, inner cordon surveys around the business district to determine the desires of internal traffic, and a parking survey to determine what steps might be taken to alleviate the serious parking problem.



Central Avenue -- 1913





DIAGRAMMATIC MAP
OF
MONTANA

GREAT FALLS TRAFFIC SURVEY

VICINITY MAP

PLATE 4

GREAT FALLS TRAFFIC SURVEY

POPULATION AND MOTOR VEHICLE TRENDS

GREAT FALLS AND CASCADE COUNTY

PLATE 5

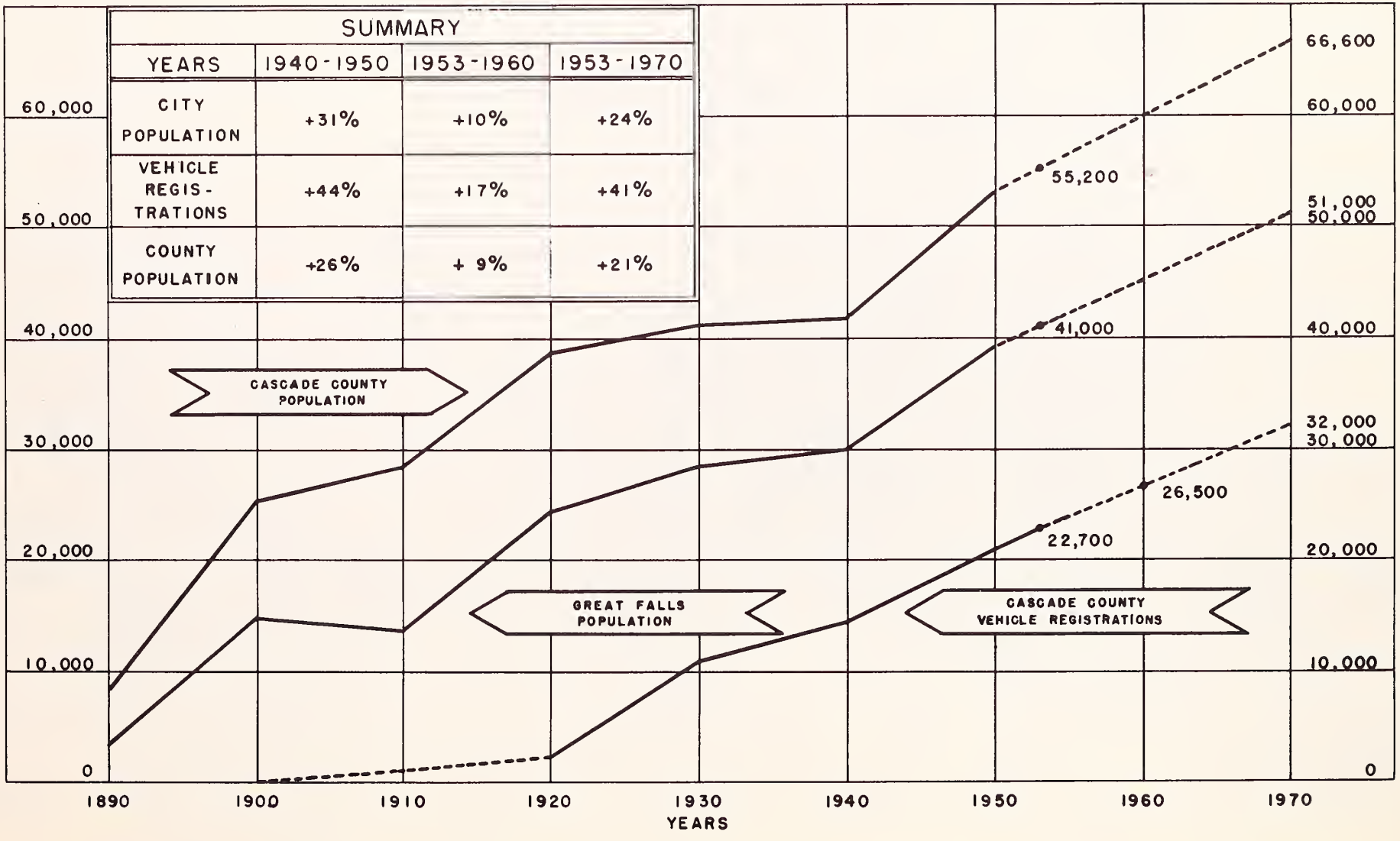


PLATE 6

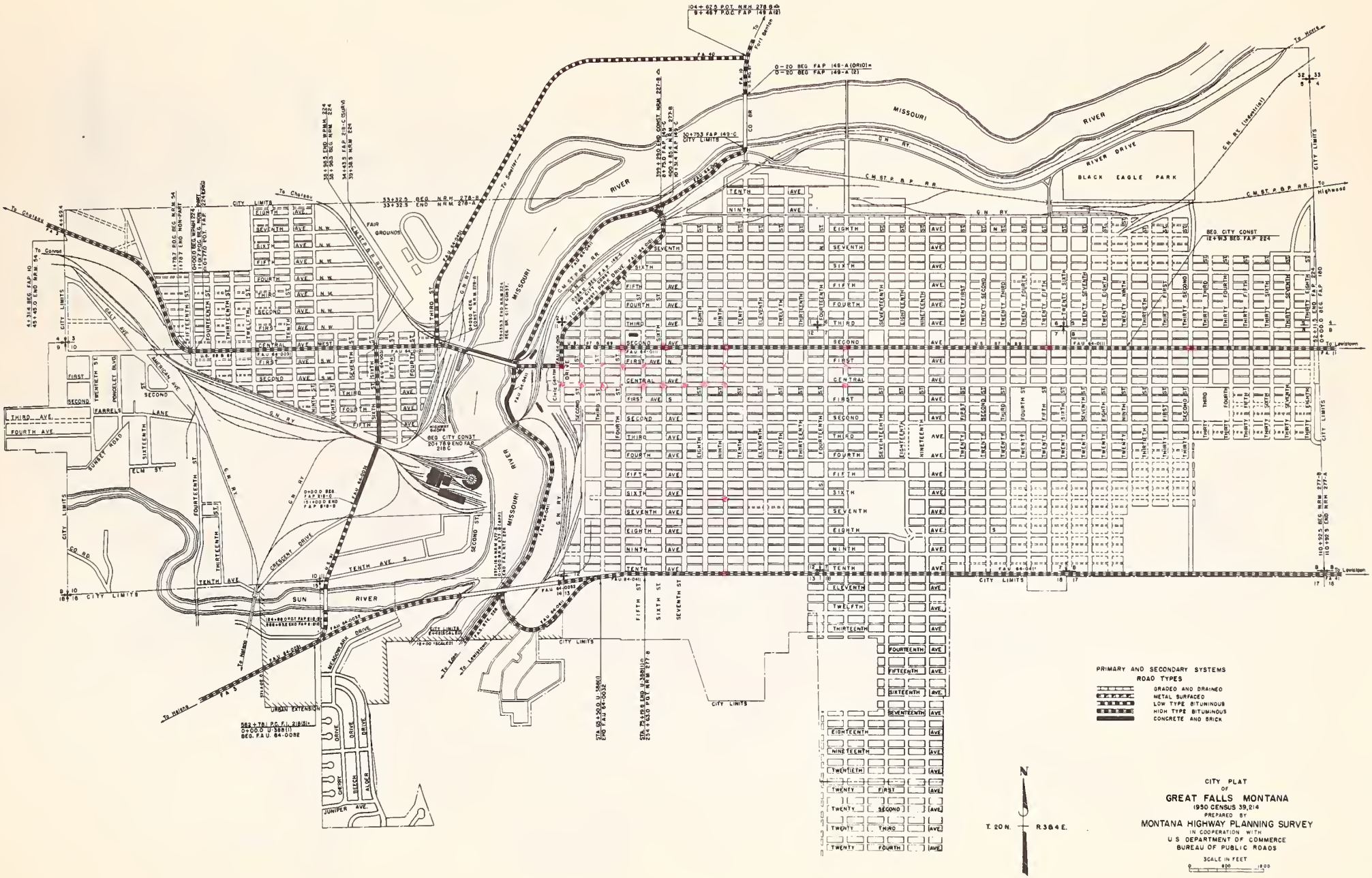
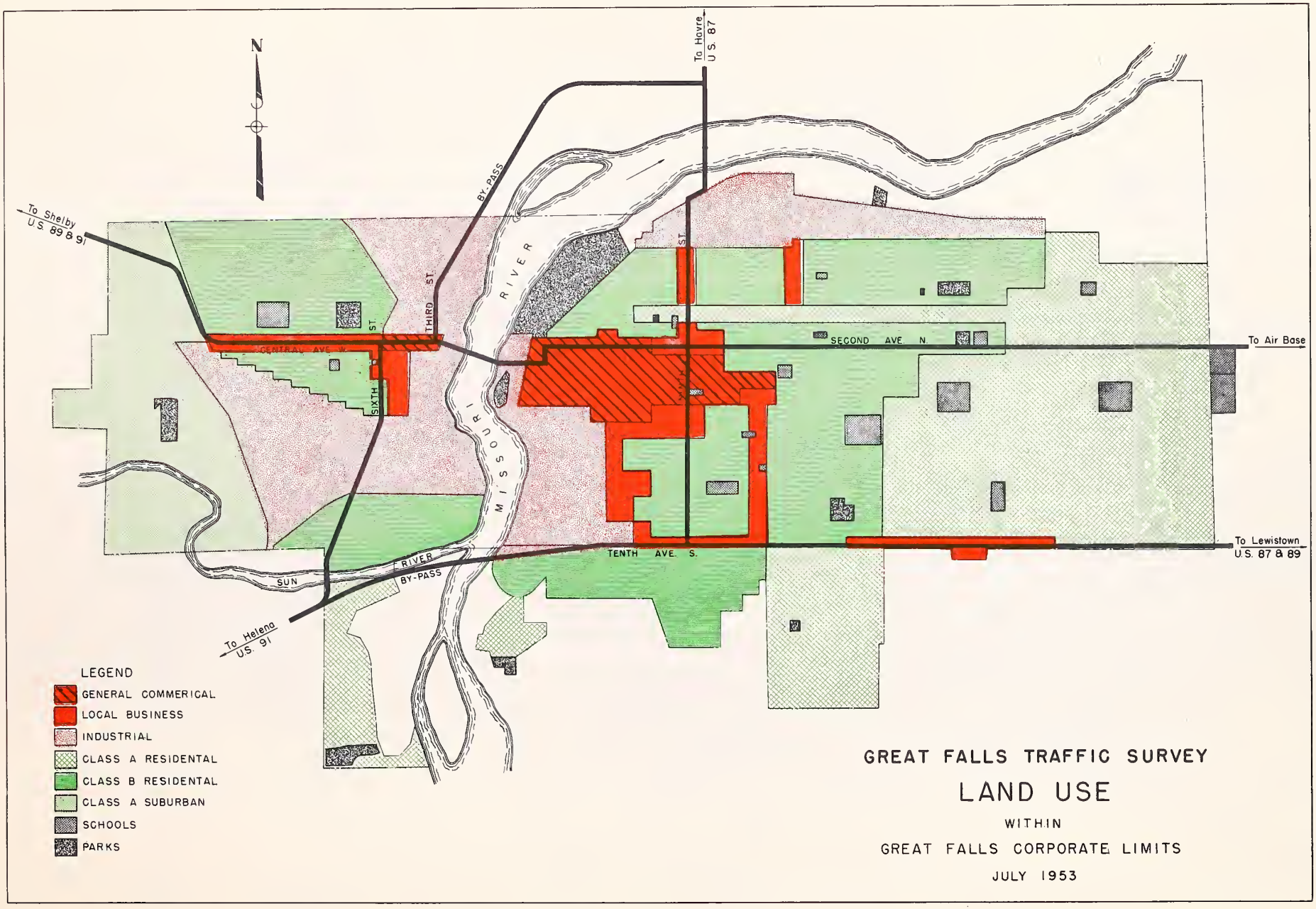

MISSOURI RIVER
BLACK EAGLE PARK
RIVER DRIVE
FAIR GROUNDS
SUN RIVER
MEADOWLARK DRIVE
CRESCENT DRIVE
CIVIC CENTER PLAZA
CITY LIMITS
To Chateau
To Conrad
To Havre
To Lewistown
To Highwood
To Great Falls
G N RY
C M ST P & P RR
CO RR
PRIMARY AND SECONDARY SYSTEMS
ROAD TYPES
GRADED AND DRAINED
METAL SURFACED
LOW TYPE BITUMINOUS
HIGH TYPE BITUMINOUS
CONCRETE AND BRICK
T. 20 N.
R. 3 & 4 E.
CITY PLAT
OF
GREAT FALLS MONTANA
1950 CENSUS 39,214
PREPARED BY
MONTANA HIGHWAY PLANNING SURVEY
IN COOPERATION WITH
U.S. DEPARTMENT OF COMMERCE
BUREAU OF PUBLIC ROADS
SCALE IN FEET
0 800 1600

PLATE 7



GREAT FALLS TRAFFIC SURVEY

LAND USE

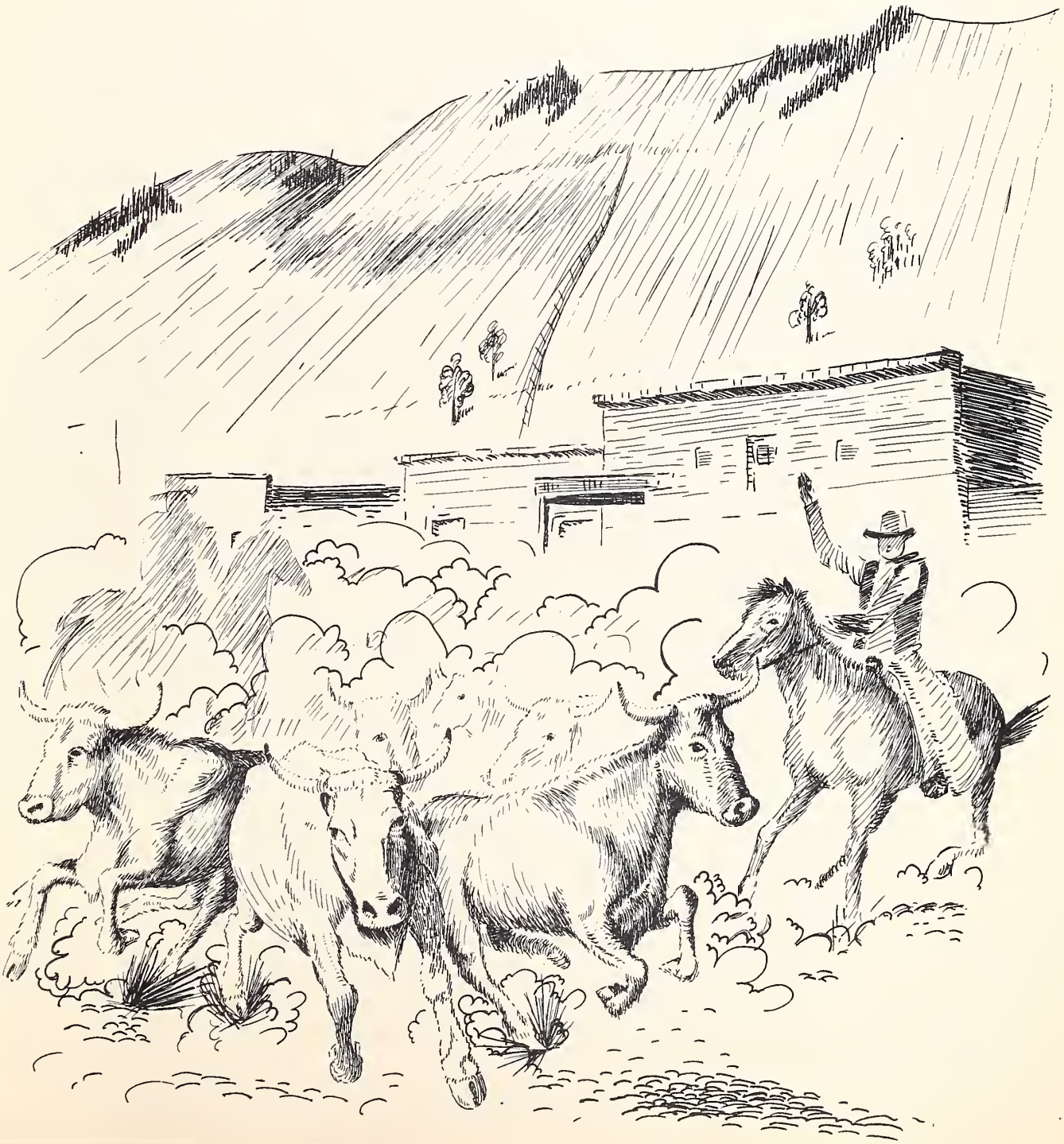
WITHIN

GREAT FALLS CORPORATE LIMITS

JULY 1953

Part One

Traffic Volumes



TRAFFIC VOLUMES

In any analysis of a traffic problem it is necessary that adequate data be available concerning the traffic habits and patterns in the area being studied. The following charts graphically present data on hourly and daily traffic patterns in usable form.

The hourly traffic volume pattern as indicated on Plate 9 shows that the maximum volume of traffic on Great Falls' streets occurs between 4 and 6 P.M. during an average weekday. A further analysis of manual counts taken at all major street intersections and tabulated by 15-minute intervals indicates that the actual peak hour volume occurs between 4:30 and 5:30 P.M. This is a typical condition found in most urban areas.

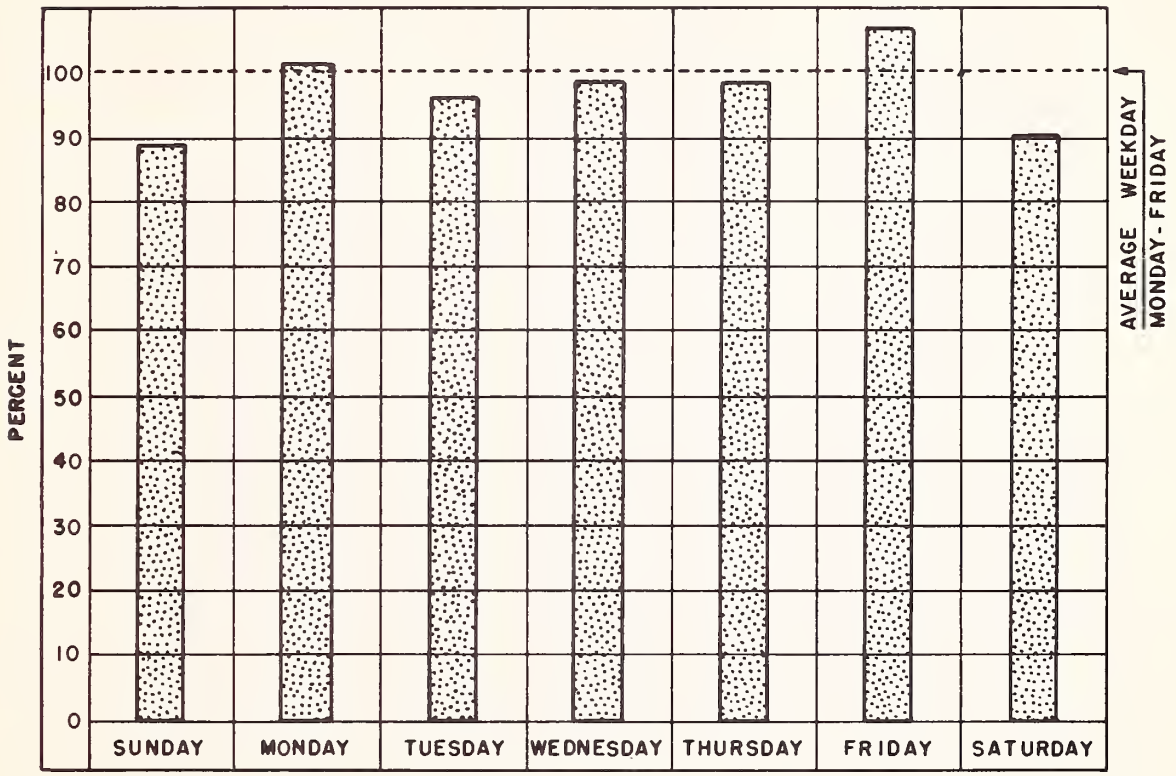
Inasmuch as the adequacy of a street system depends upon its capability to handle peak hour traffic volumes, Plate 12 was prepared to show these volumes on the principal streets of the city.

The thirtieth highest hour of traffic occurring during the year has generally been accepted as a volume for which a highway or street facility can be most practically designed. In Great Falls, data on the thirtieth maximum hour was not available, due to the lack of continuous counts throughout the year. Therefore, a method which has been used in other urban areas was employed to select a design volume approaching the thirtieth maximum hour. Plate 11 indicates the design volume selected in Great Falls, based on the plotting of the sixteen highest recorded hourly volumes at a control station in the First Avenue North viaduct during the period from June 24 to July 9. It will be noted that the design hour selected is the third highest recorded volume, and it is believed that it will be exceeded approximately twenty-nine times during the year.

Due to the fact that it is not economically feasible to design a facility for the maximum traffic load, the design hour volume, as selected, has been used as a basis in computing the traffic capacities of existing streets in Great Falls.

GREAT FALLS TRAFFIC SURVEY
DAILY VARIATION AND HOURLY PERCENTAGE
AVERAGE WEEKDAY TRAFFIC
FIRST AVENUE NORTH VIADUCT

JULY 1953



HOURLY PERCENTAGE

HOURS A.M.	PERCENT	HOURS P.M.	PERCENT
12-1	2.1	12-1	6.0
1-2	1.2	1-2	6.5
2-3	0.9	2-3	6.0
3-4	0.6	3-4	6.3
4-5	0.4	4-5	7.1
5-6	0.5	5-6	8.3
6-7	1.0	6-7	6.2
7-8	2.5	7-8	5.5
8-9	4.9	8-9	5.9
9-10	4.4	9-10	5.5
10-11	5.0	10-11	4.1
11-12	5.2	11-12	3.9

PLATE 8

GREAT FALLS TRAFFIC SURVEY
HOURLY TRAFFIC VOLUME PATTERN
FIRST AVENUE NORTH VIADUCT
JUNE 24, JULY 9, 1953

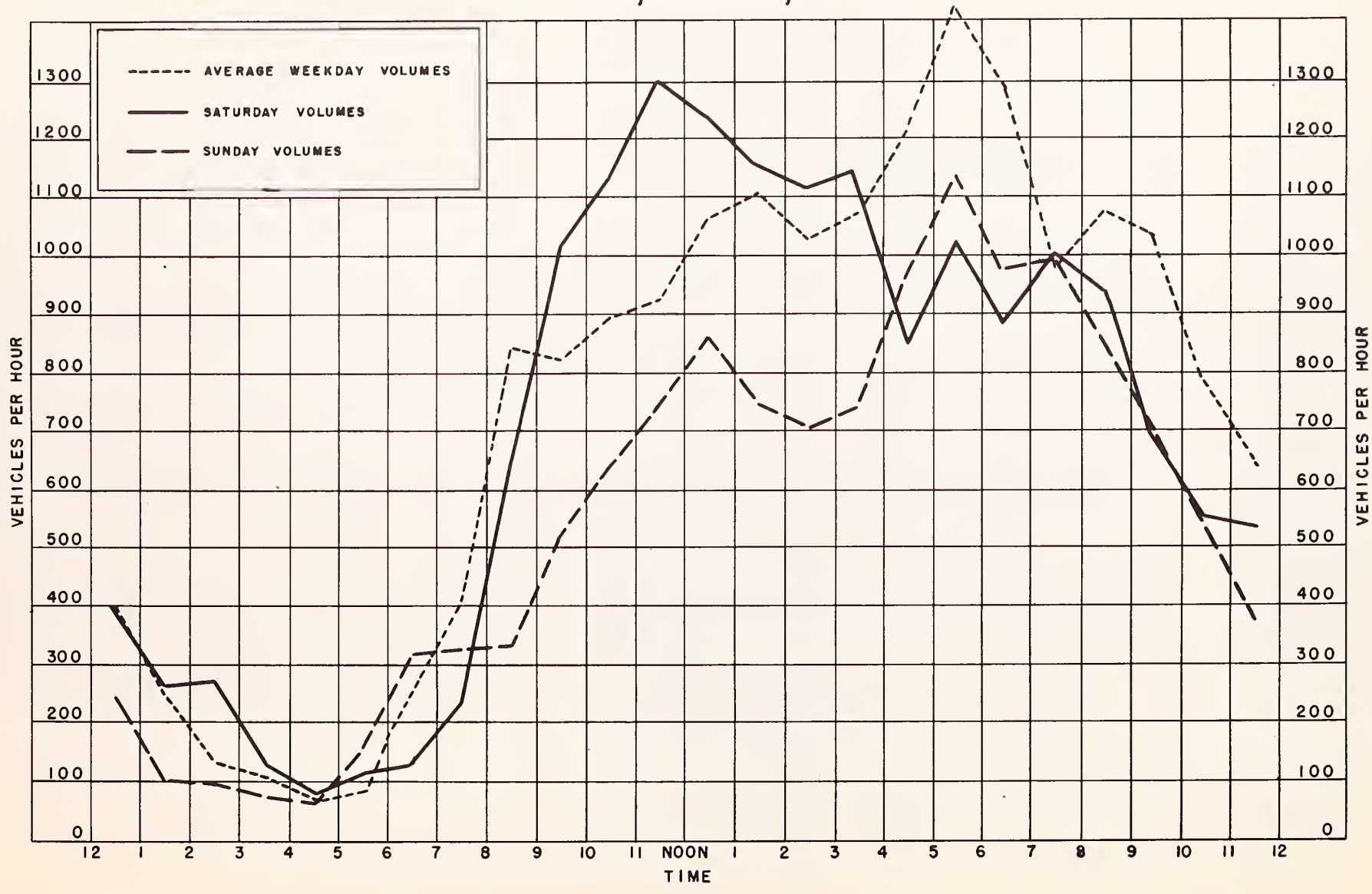
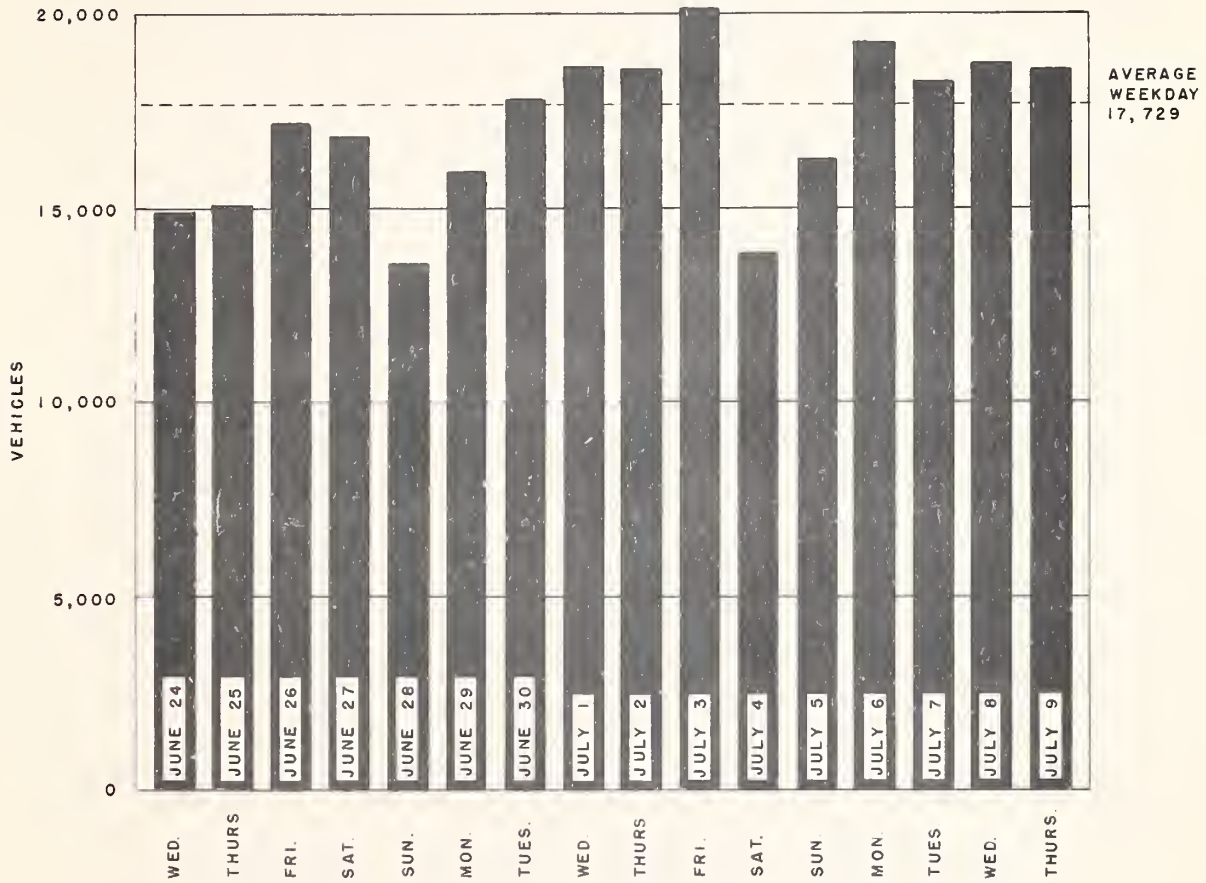


PLATE 9

GREAT FALLS TRAFFIC SURVEY
MECHANICALLY RECORDED TRAFFIC VOLUMES
FIRST AVENUE NORTH VIADUCT
JUNE 24 - JULY 9, 1953



PEAK HOUR TRAFFIC VOLUMES
5-6 P.M.

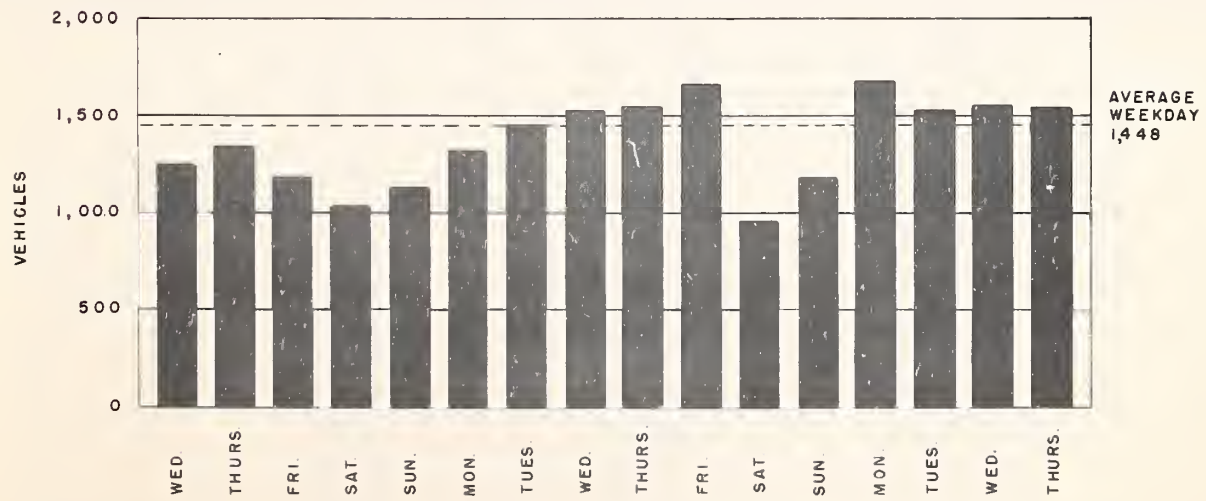
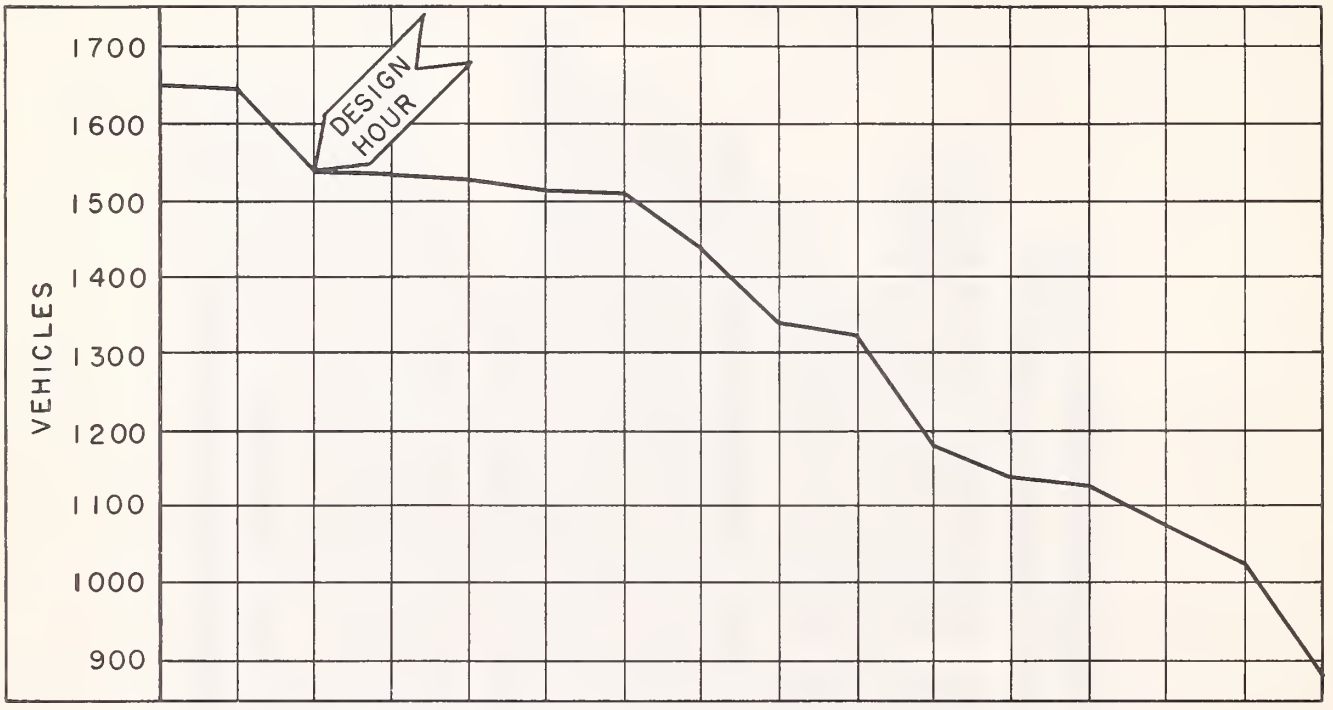


PLATE 10

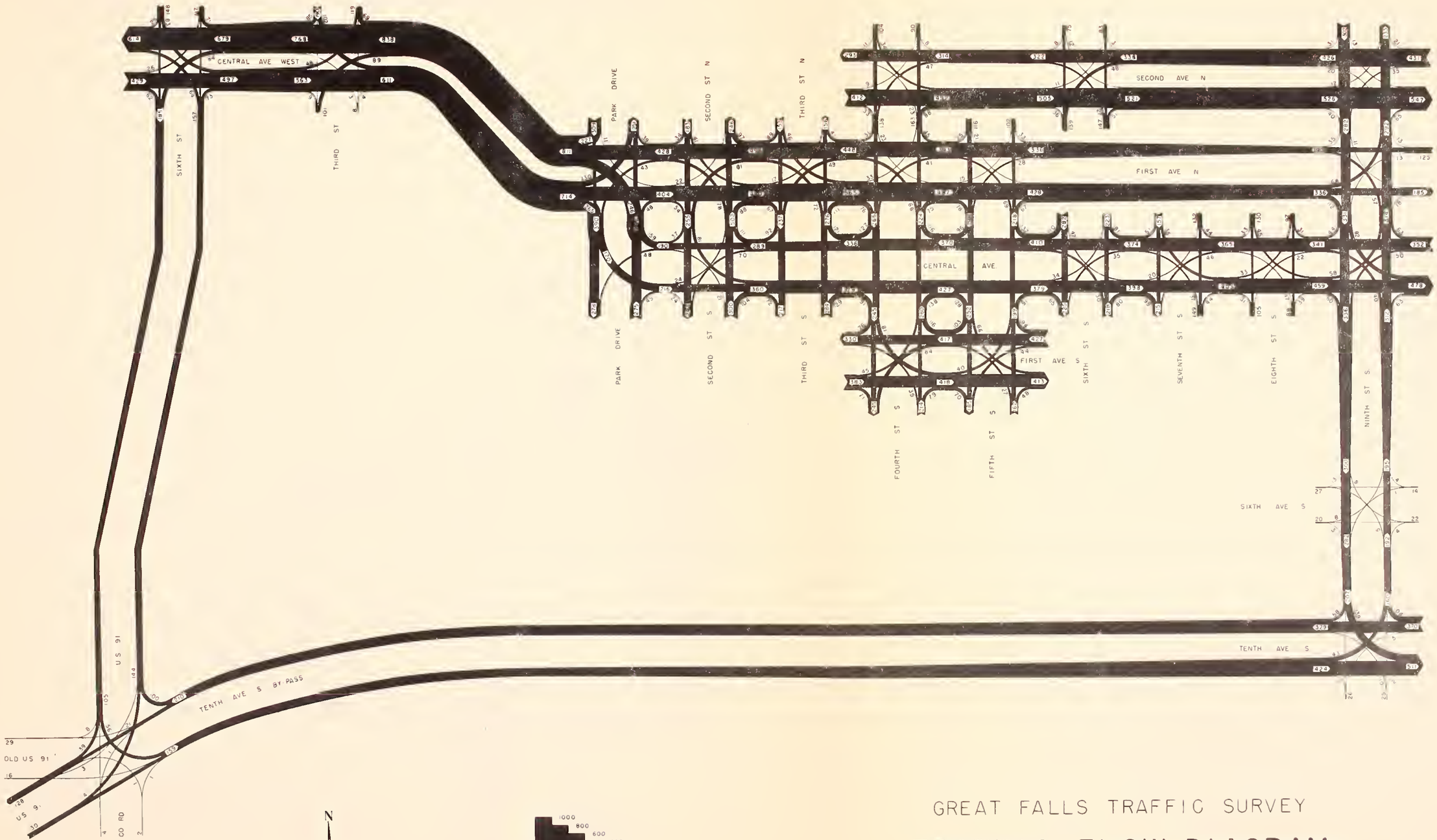
GREAT FALLS TRAFFIC SURVEY
PEAK HOUR VOLUMES AND DESIGN HOUR
5:00 - 6:00 P.M.



HIGHEST RECORDED PEAK HOUR VOLUMES

RECORDED PEAK HOUR VOLUMES (5:00 - 6:00 P.M.)
ON FIRST AVENUE NORTH VIADUCT

NO.	DAY	DATE	PEAK HOUR VOLUME	DESIGN FACTOR	
1	MONDAY	JULY 6	1650	0.93	
2	FRIDAY	JULY 3	1645	0.93	
3	WEDNESDAY	JULY 8	1537	1.00	DESIGN HOUR
4	THURSDAY	JULY 9	1534	1.00	
5	THURSDAY	JULY 2	1528	1.01	
6	TUESDAY	JULY 7	1514	1.02	
7	WEDNESDAY	JULY 1	1511	1.02	
8	TUESDAY	JUNE 30	1437	1.07	
9	THURSDAY	JUNE 25	1338	1.15	
10	MONDAY	JUNE 29	1320	1.16	
11	SUNDAY	JULY 5	1179	1.30	
12	SUNDAY	JUNE 28	1137	1.35	
13	FRIDAY	JUNE 26	1125	1.37	
14	WEDNESDAY	JUNE 24	1073	1.43	
15	SATURDAY	JUNE 27	1025	1.50	
16	SATURDAY	JULY 4	883	1.74	



GREAT FALLS TRAFFIC SURVEY

TRAFFIC FLOW DIAGRAM

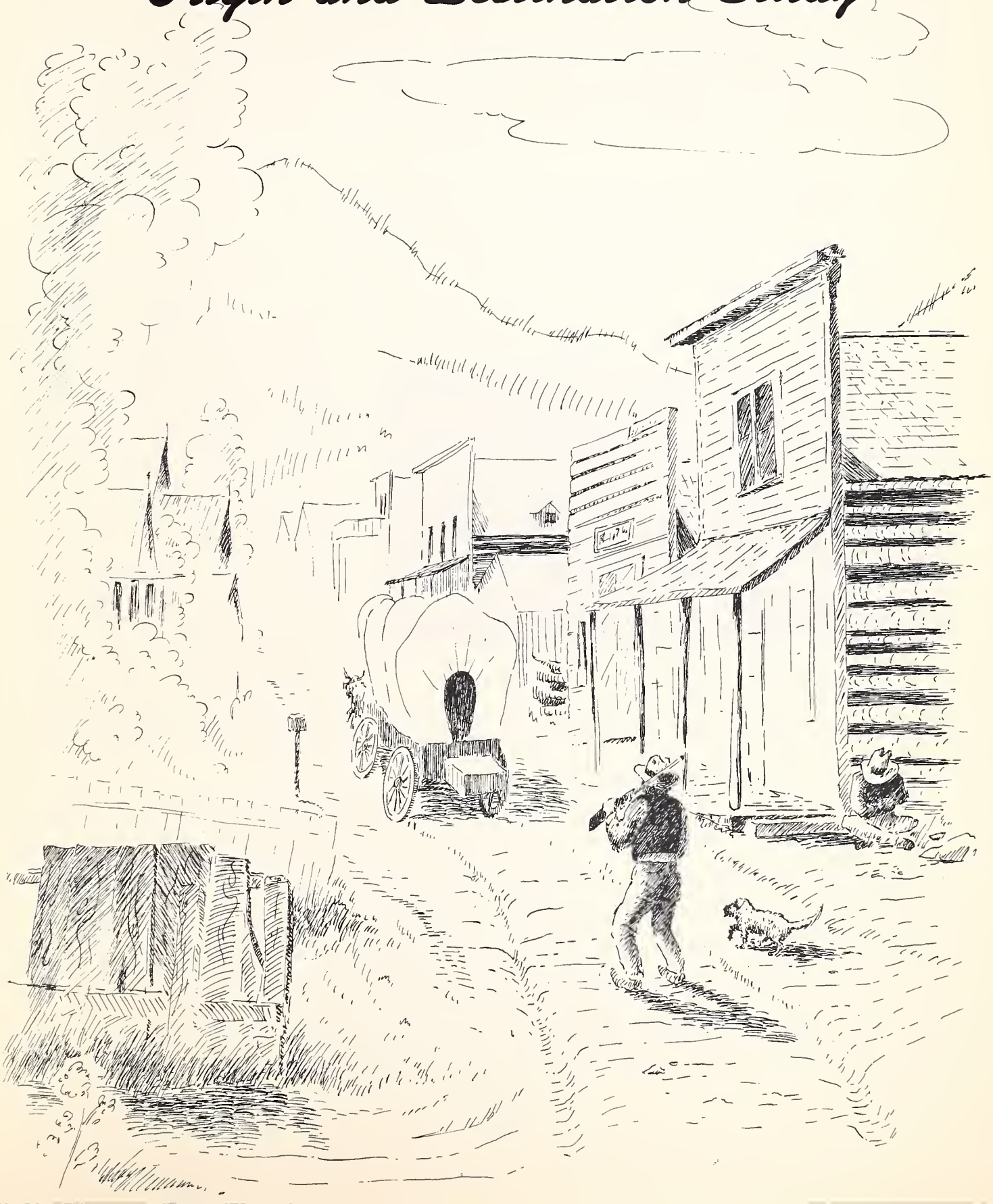
PEAK-HOUR (4:30 TO 5:30 P.M.)

JULY 1953

PLATE 12

Part Two

Inner Cordon Origin and Destination Study



INNER CORDON ORIGIN AND DESTINATION STUDY

The fundamental purpose of any origin and destination traffic survey is to measure within reasonable accuracy the needs of street and highway users in a given area. An inner cordon type survey is confined to a study of the travel habits of those vehicles crossing the inner cordon, usually surrounding the central business district of a city. In Great Falls an inner cordon type study was accomplished by stopping and interviewing the operators of over 31,000 vehicles outbound from the inner cordon area.

Twenty-five interview stations were established on a cordon line enclosing the business district. All stations on each of the four sides were operated by trained interviewers, simultaneously, in order to keep by-passing to a minimum. Outbound motorists were questioned concerning their origin, destination, trip purpose, length of time parked, and type of parking used. Each station was operated for a minimum of 16 hours, and three of the heaviest stations were operated for a full 24 hours. All interviews were conducted on weekdays, Monday through Friday, during June of 1953. Cooperative motorists under the able traffic direction of the City Police kept delays to a minimum and enabled an interview to be completed in approximately 30 seconds.

Interviewing on First Avenue North Bridge

To provide factors for expansion of the interview sample to a 24-hour average, it was necessary to manually count all traffic entering and leaving the cordon area while the interviewing was in progress. These manual classification counts provide an hourly record of all vehicles by type and direction of travel and were also used in determining the peak hour of accumulation. In addition to manual counts, machine counts were taken at each station previous to the start of the survey to determine the average weekday traffic. One master control station was operated continuously during the interviewing to facilitate any factor adjustments that were necessary.

The outbound traffic movement on an average 24-hour weekday in June totaled 49,710 vehicles. Of this number, 31,534 drivers were interviewed, or 63%. During the hours of survey, however, 82% of all outbound traffic was interviewed.

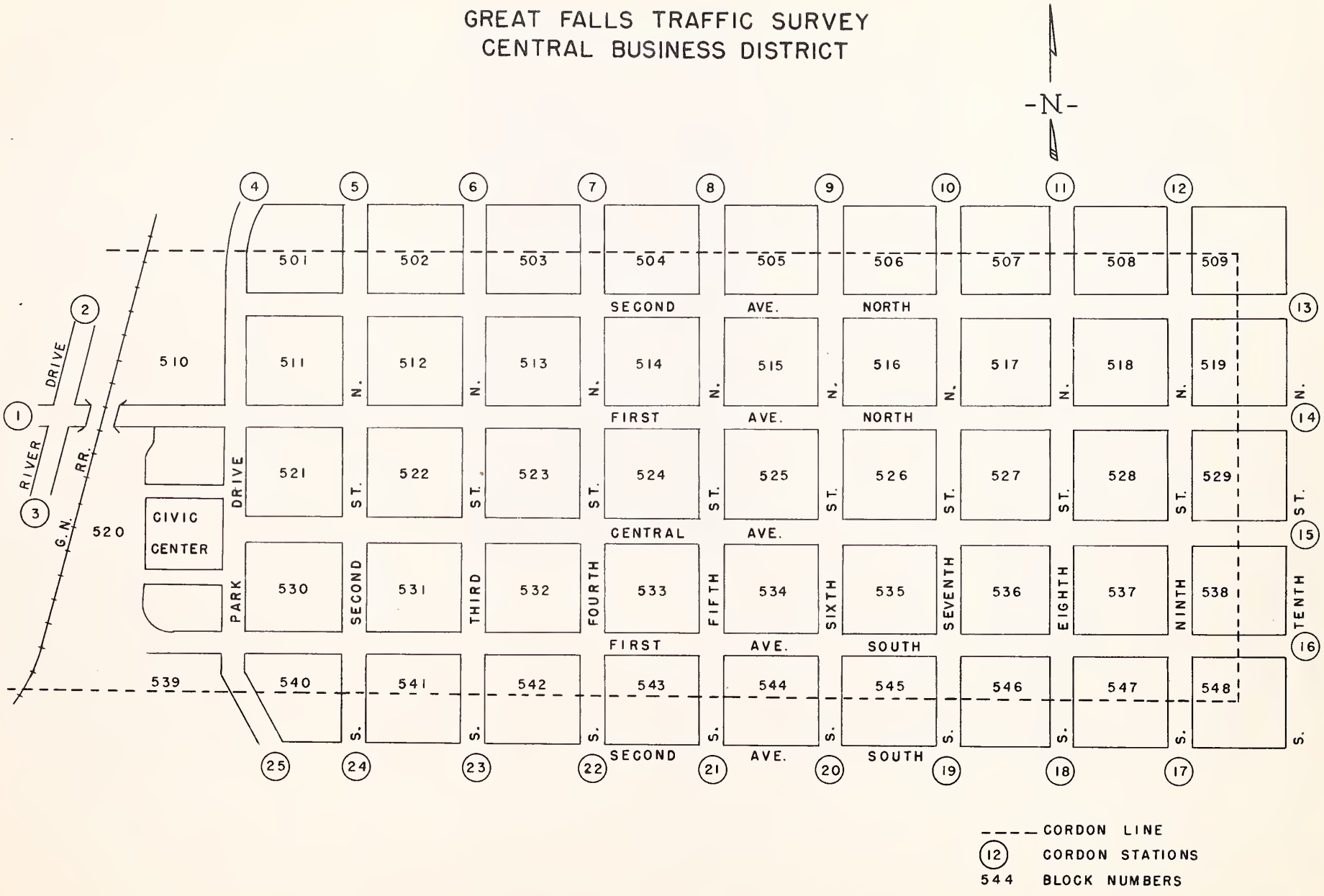
The analysis of the interviews taken in the origin and destination survey required that vehicle trips be summarized into groups large enough to denote significant travel patterns. For this purpose the Great Falls metropolitan area was divided into forty-one zones. The boundaries of these zones were established to represent as closely as practicable areas that were homogeneous in land use characteristics, and all trips originating in or destined to the same area or zone were placed in one group.

One of the applications of origin and destination data is the construction of desire lines of travel. These lines, or bands, of travel plotted to scale extend from point of origin to point of destination, and represent the shortest paths of travel that traffic would use if facilities were available. Thus, it is possible to gain some indication of the most desirable location of street or highway improvements from a traffic standpoint.

The following series of charts show the desire lines of various movements of traffic developed by the traffic study in the Great Falls metropolitan area.

PLATE 13

GREAT FALLS TRAFFIC SURVEY
CENTRAL BUSINESS DISTRICT



LEGEND

2 EXTERNAL ORIGIN & DESTINATION STATION LOCATION

ZONE BOUNDARIES

NOTE TRAFFIC FIGURES SHOWN REPRESENT 24 HOUR AVERAGE WEEKDAY VOLUMES FOR JUNE 1953

N

1 TO HAVRE (87)

4 TO SHELBY (89-91)

MISSOURI RIVER

FIRST AVE. N.W.

NINTH ST.

G.N. RR.

CENTRAL BUSINESS DISTRICT

RIVER

FIFTEENTH ST. N.

TWENTY FIRST ST. N.

TWENTY SEVENTH ST. N.

THIRTY FOURTH ST. N.

EIGHTH AVE N

SECOND AVE N

FOURTH AVE S

TENTH AVE S

NINTH ST

FIFTEENTH ST S.

THIRD AVE S

EAST BASE ROAD

SUN RIVER

MISSOURI

3 TO HELENA (91)

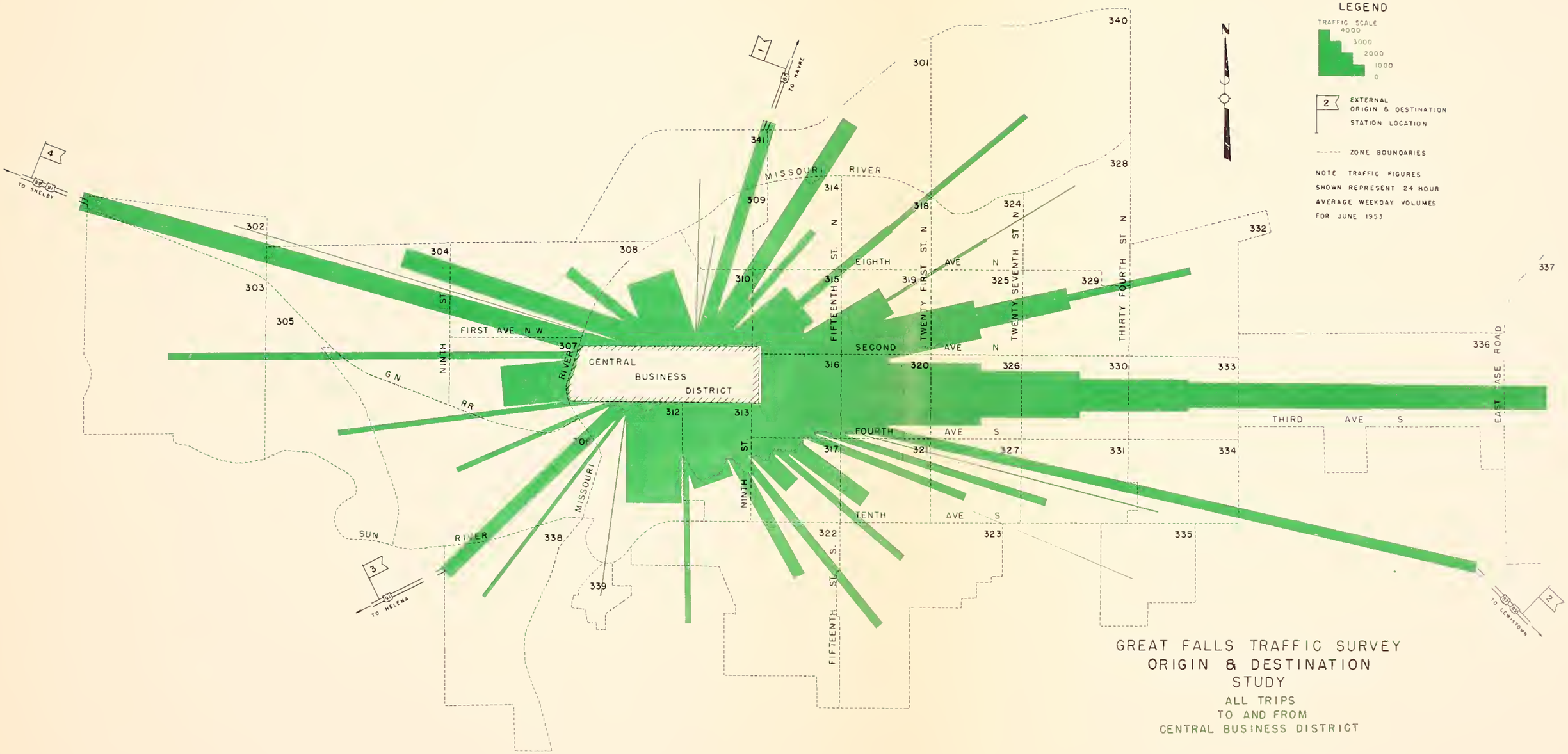
2 TO LEWISTOWN (87-89)

GREAT FALLS TRAFFIC SURVEY
ORIGIN & DESTINATION
STUDY

ALL TRIPS TO OR FROM CENTRAL BUSINESS DISTRICT

Plate 15 illustrates the approximate desire lines of all trips having either an origin or destination in the Central Business District of Great Falls on an average weekday in June of 1953.

60,403 one-way trips, representing 76% of the total volume crossing the inner cordon line, had either an origin or destination in the Central Business District. 9% of the total trips to the Central Business District had either an origin or destination outside of the metropolitan area.



GREAT FALLS TRAFFIC SURVEY
ORIGIN & DESTINATION
STUDY

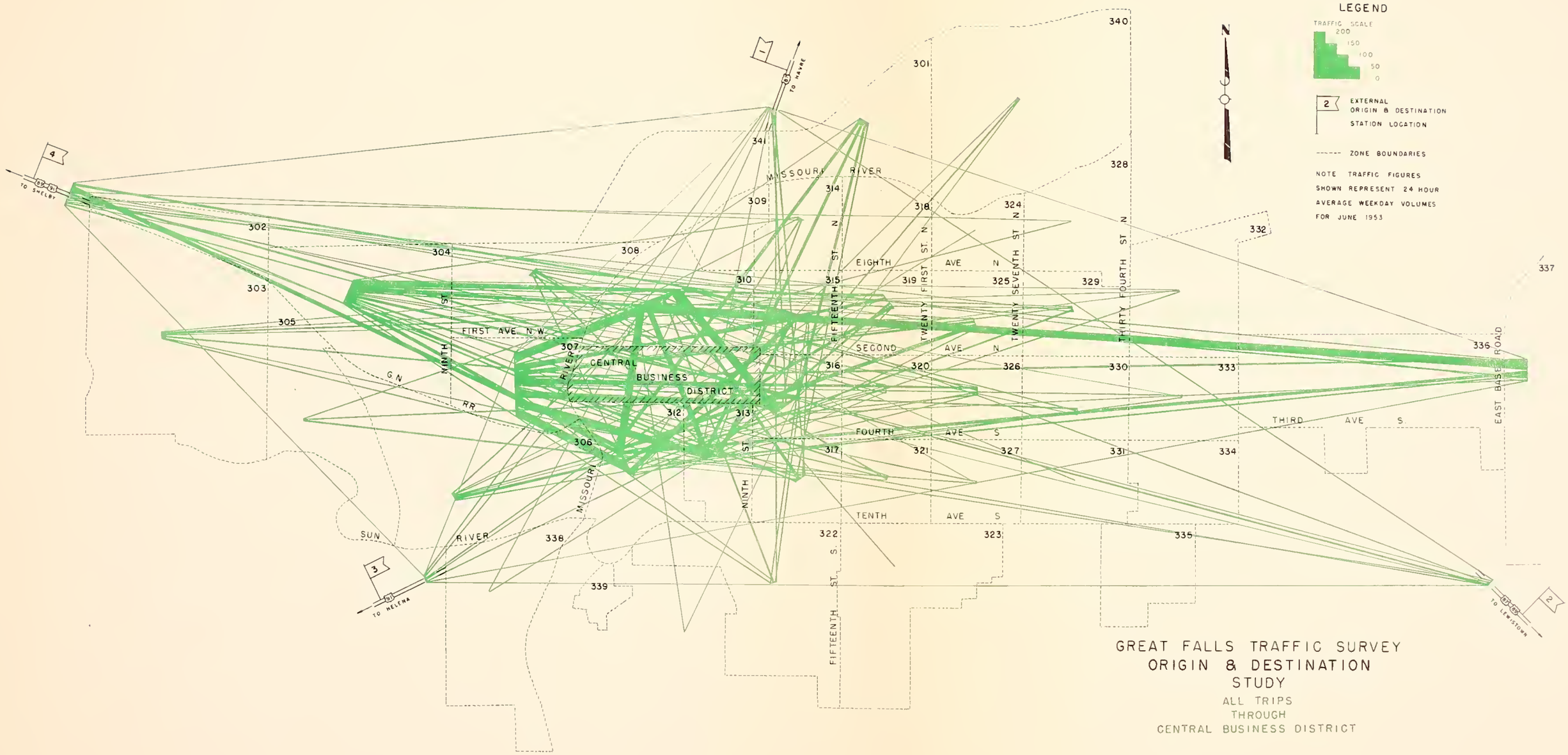
ALL TRIPS
TO AND FROM
CENTRAL BUSINESS DISTRICT

PLATE 15

ALL TRIPS THROUGH CENTRAL BUSINESS DISTRICT

19,020 one-way trips could theoretically by-pass the Central Business District during an average weekday in June of 1953. This figure represents 24% of the total number of trips crossing the inner cordon.

Plate 16 shows the zone-to-zone movement through the Central Business District of trips with a volume range of 25 or more. Zone-to-zone movements of less than 25 trips are not shown due to their relative unimportance.

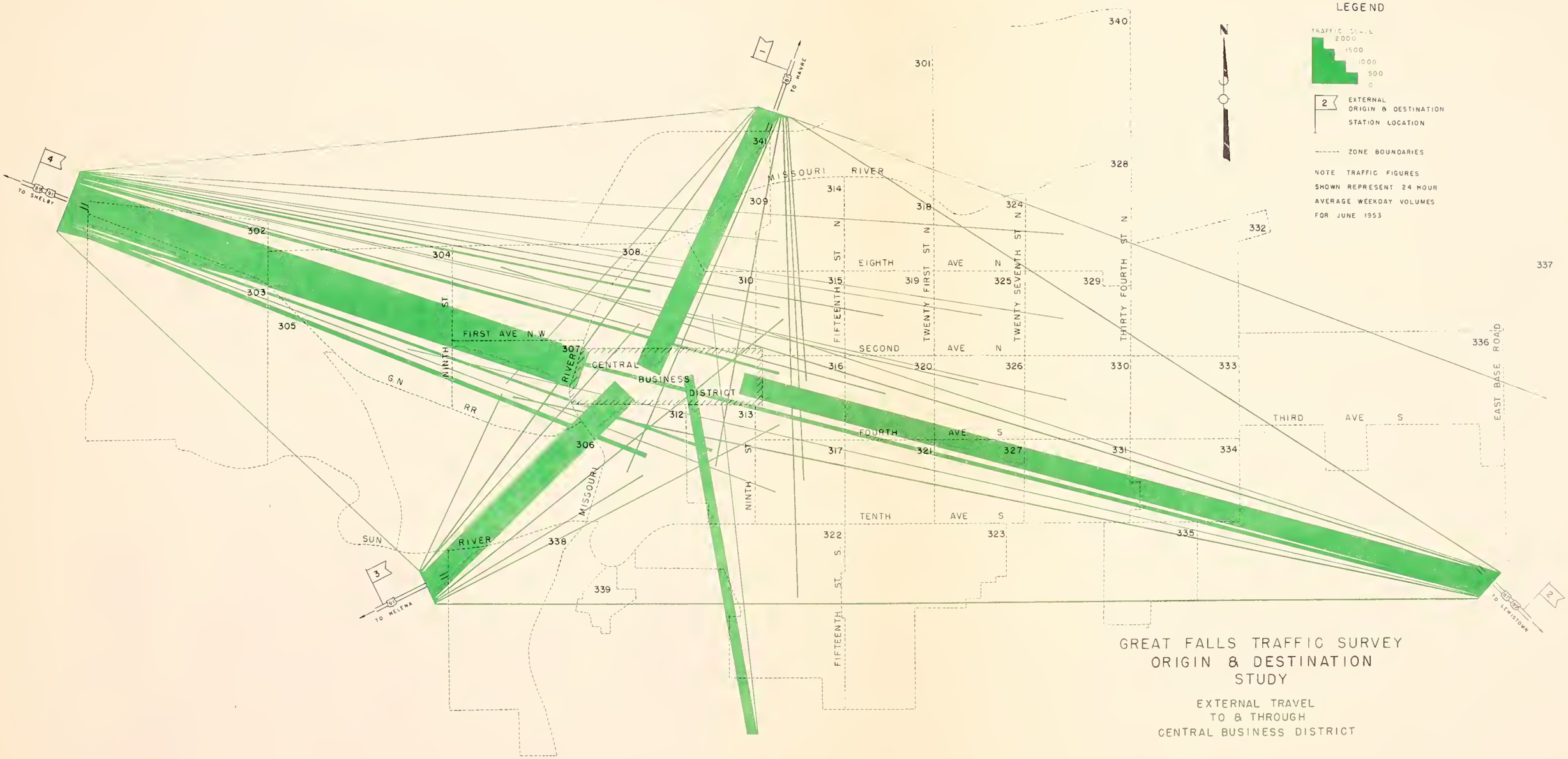


GREAT FALLS TRAFFIC SURVEY
ORIGIN & DESTINATION
STUDY
ALL TRIPS
THROUGH
CENTRAL BUSINESS DISTRICT

PLATE 16

EXTERNAL TRAVEL TO AND THROUGH CENTRAL BUSINESS DISTRICT

Plate 17 shows the desire lines of 8,367 one-way trips that crossed the inner cordon line but had either an origin or destination outside the metropolitan area. These trips represent 11% of the total volume. Only those volumes of 25 or more trips per day have been plotted in the interest of clarity.



GREAT FALLS TRAFFIC SURVEY
ORIGIN & DESTINATION STUDY

EXTERNAL TRAVEL
TO & THROUGH
CENTRAL BUSINESS DISTRICT

PLATE 17

Part Three

External Origin and Destination Study

EXTERNAL ORIGIN AND DESTINATION STUDY

In order to obtain as complete a picture as possible of the travel habits in the Great Falls area, it was deemed necessary to conduct an external, as well as an internal, origin and destination survey. This survey was completed in August of 1952, but is presented in this report in conjunction with the internal, or inner cordon, origin and destination survey completed in June of 1953. All traffic volumes shown on the following series of charts are for an average 24-hour weekday in August of 1952.

Four external interview stations were established near the city limits on the four main U.S. highways entering Great Falls. Each station was operated for a total of 16 hours, divided into two 8-hour shifts on alternate weekdays. Outbound motorists only were interviewed, according to the established practice in a survey of this type. While the interviewing was in progress, manual classification counts were taken at all stations to provide the necessary hourly expansion factors.

The number of usable interviews at all stations totaled 4,085. This number represents 43% of the average 24-hour traffic in both directions and 89% of the total outbound traffic during the hours in which the interviews were conducted.

As in the inner cordon survey, the metropolitan area was divided into the same 41 zones according to land use, so that certain movements of traffic might be identified and grouped. The information obtained from each interview was then translated into a numerical code for processing and tabulating on International Business Machine equipment.

One of the main purposes of this type of survey is to establish the volume of traffic that can by-pass the city so that perimeter routes can either be located or improved. It was found that the traffic that did not stop in the city for essential purposes was comparatively light. This condition can no doubt be attributed to Great Falls' location and the relatively long distances between large cities in Montana.

The approximate desire lines of travel to the internal zones and other external stations are plotted to scale on Plates 19 - 26 inclusive.

LEGEND

2 EXTERNAL ORIGIN & DESTINATION STATION LOCATION

----- ZONE BOUNDARIES

NOTE TRAFFIC FIGURES SHOWN REPRESENT 24 HOUR AVERAGE WEEKDAY VOLUME FOR AUGUST 1952

N

1 TO HAVRE

4 TO SHELBY 89-91

3 TO HELENA 91

2 TO LEWISTOWN 87-89

MISSOURI RIVER

SUN RIVER

MISSOURI RIVER

GN RR

FIRST AVE N W.

NINTH ST.

RIVER

CENTRAL BUSINESS DISTRICT

EIGHTH AVE N

SECOND AVE N

FOURTH AVE S

TENTH AVE S

THIRD AVE S.

FIFTEENTH ST N

TWENTY FIRST ST N

TWENTY SEVENTH ST N

THIRTY FOURTH ST N

NINTH ST

FIFTEENTH ST S

EAST BASE ROAD

301 302 303 304 305 306 307 308 309 310 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341

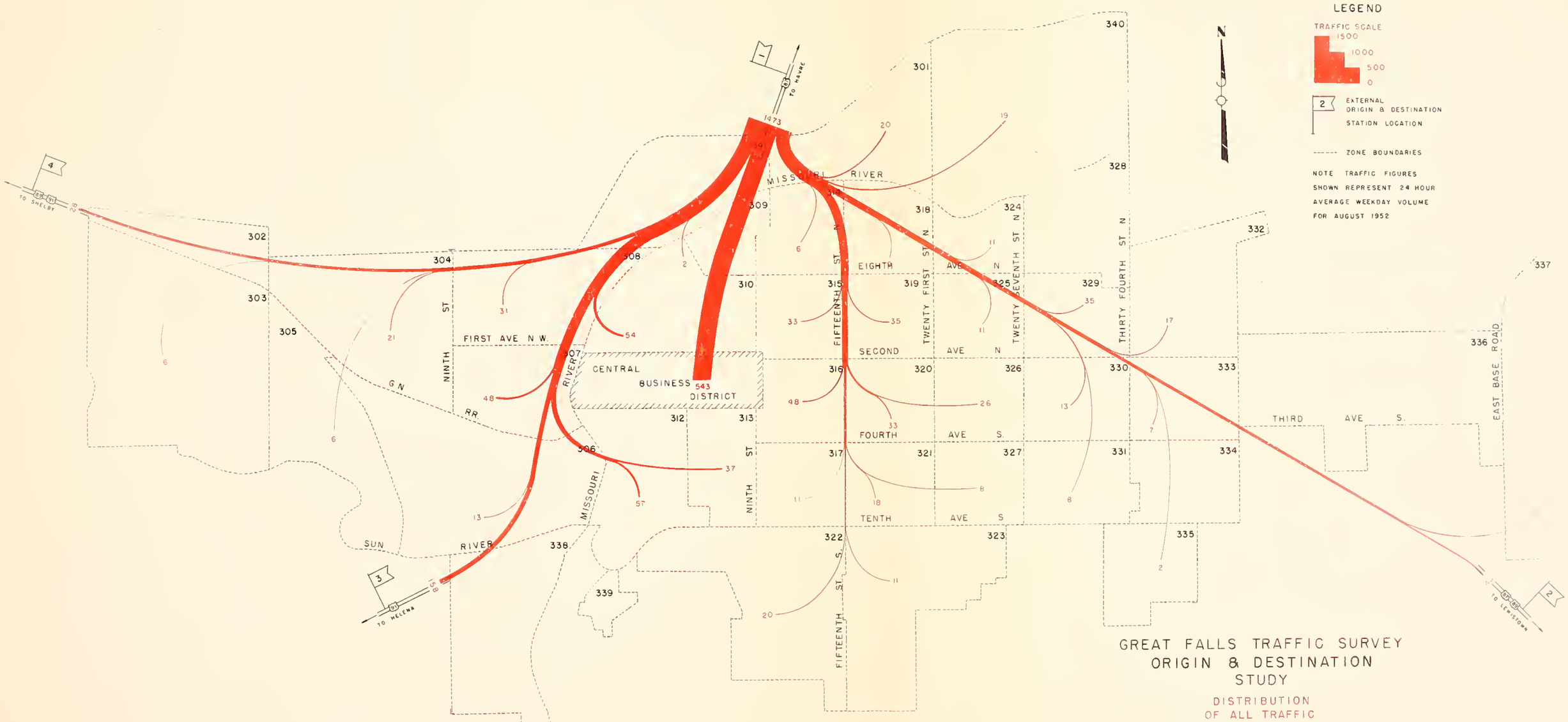
GREAT FALLS TRAFFIC SURVEY
ORIGIN & DESTINATION STUDY

DISTRIBUTION OF ALL TRAFFIC PASSING
STATION 1

The distribution of all traffic passing Station 1 both entering and leaving the metropolitan area during an average weekday in August of 1952 is shown on Plate 19.

A summary of all traffic at this station follows:

Average Weekday Traffic	1473
Per Cent of Total External Traffic	15.4
Per Cent Commercial Vehicles	9.0
Per Cent to Central Business District	36.9
Per Cent to Other External Stations	15.3



GREAT FALLS TRAFFIC SURVEY
ORIGIN & DESTINATION STUDY

DISTRIBUTION OF ALL TRAFFIC PASSING STATION 1

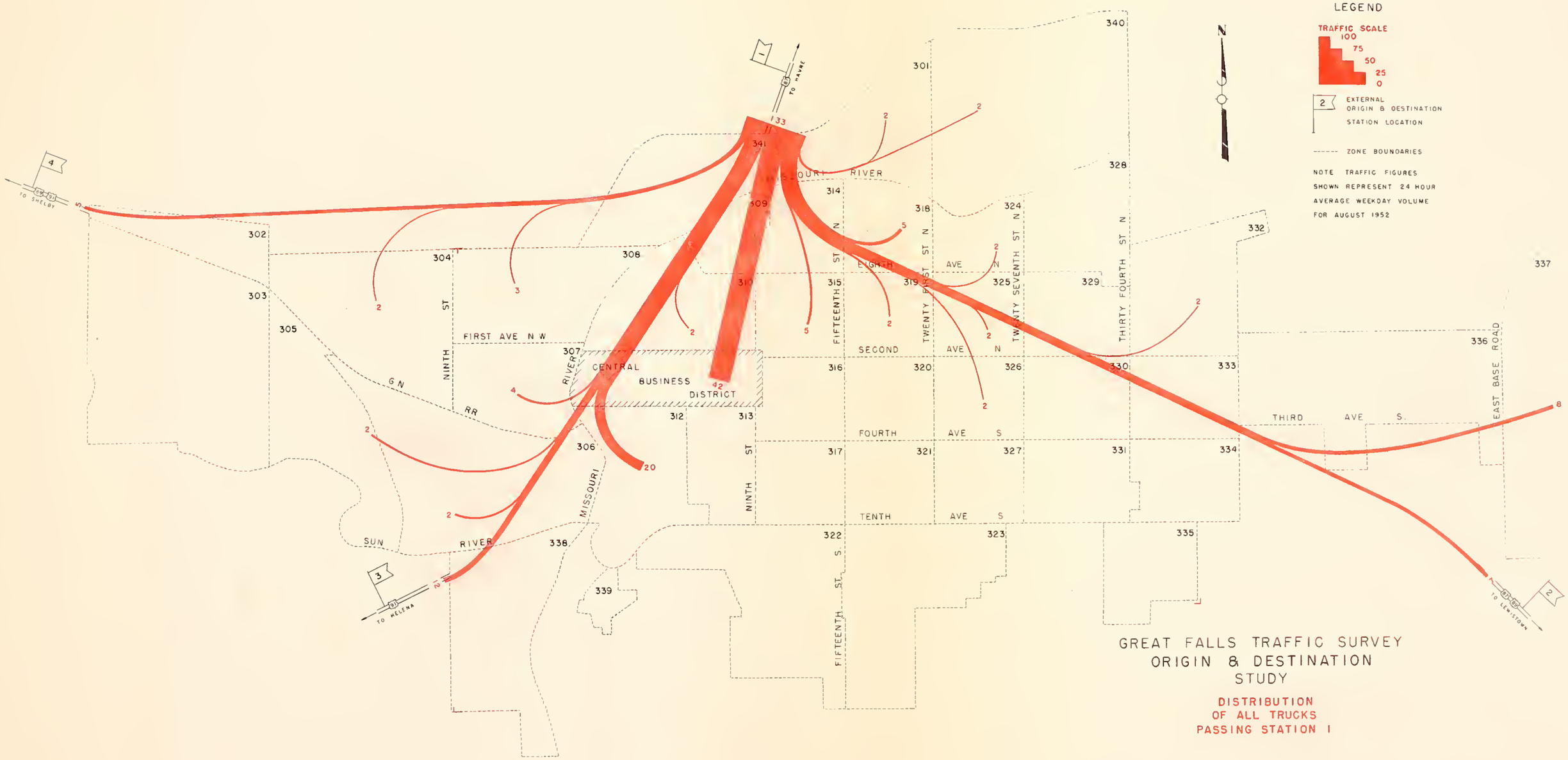
PLATE 19

DISTRIBUTION OF ALL TRUCKS PASSING STATION 1

The distribution of all trucks larger than a pickup or panel passing Station 1 during an average weekday in August, 1952, is shown on Plate 20.

A summary of commercial traffic at this station follows:

Average Weekday Commercial Traffic	133
Per Cent of Total Commercial Traffic (External)	16.4
Per Cent to Central Business District	31.6
Per Cent to Other External Stations	18.0



GREAT FALLS TRAFFIC SURVEY
ORIGIN & DESTINATION
STUDY

DISTRIBUTION
OF ALL TRUCKS
PASSING STATION 1

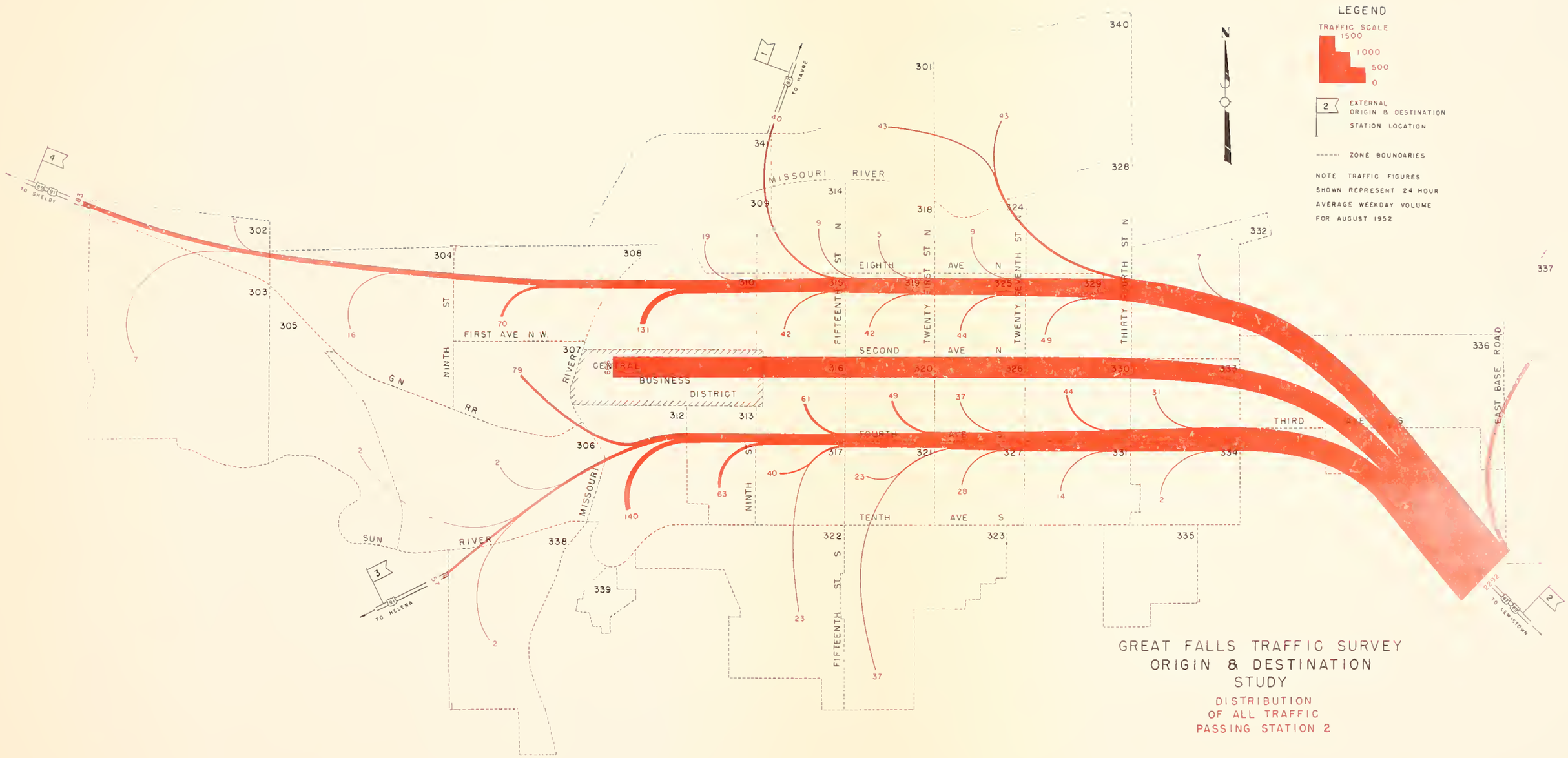
PLATE 20

DISTRIBUTION OF ALL TRAFFIC PASSING STATION 2

The distribution of all traffic passing Station 2 on an average weekday in August, 1952, is illustrated on Plate 21.

A summary of all traffic at this station follows:

Average Weekday Traffic	2292
Per Cent of Total External Traffic	23.9
Per Cent Commercial Vehicles	8.1
Per Cent to Central Business District	29.0
Per Cent to Other External Stations	12.2



GREAT FALLS TRAFFIC SURVEY
ORIGIN & DESTINATION STUDY

DISTRIBUTION OF ALL TRAFFIC PASSING STATION 2

PLATE 21

DISTRIBUTION OF ALL TRUCKS PASSING STATION 2

The distribution of all trucks larger than a pickup or panel passing Station 2 on an average weekday in August, 1952, is shown on Plate 22.

A summary of commercial traffic at this station follows:

Average Weekday Commercial Traffic	185
Per Cent of Total Commercial Traffic (External)	22.8
Per Cent to Central Business District	20.0
Per Cent to Other External Stations	22.2

GREAT FALLS TRAFFIC SURVEY
ORIGIN & DESTINATION
STUDY
DISTRIBUTION
OF ALL TRUCKS
PASSING STATION 2

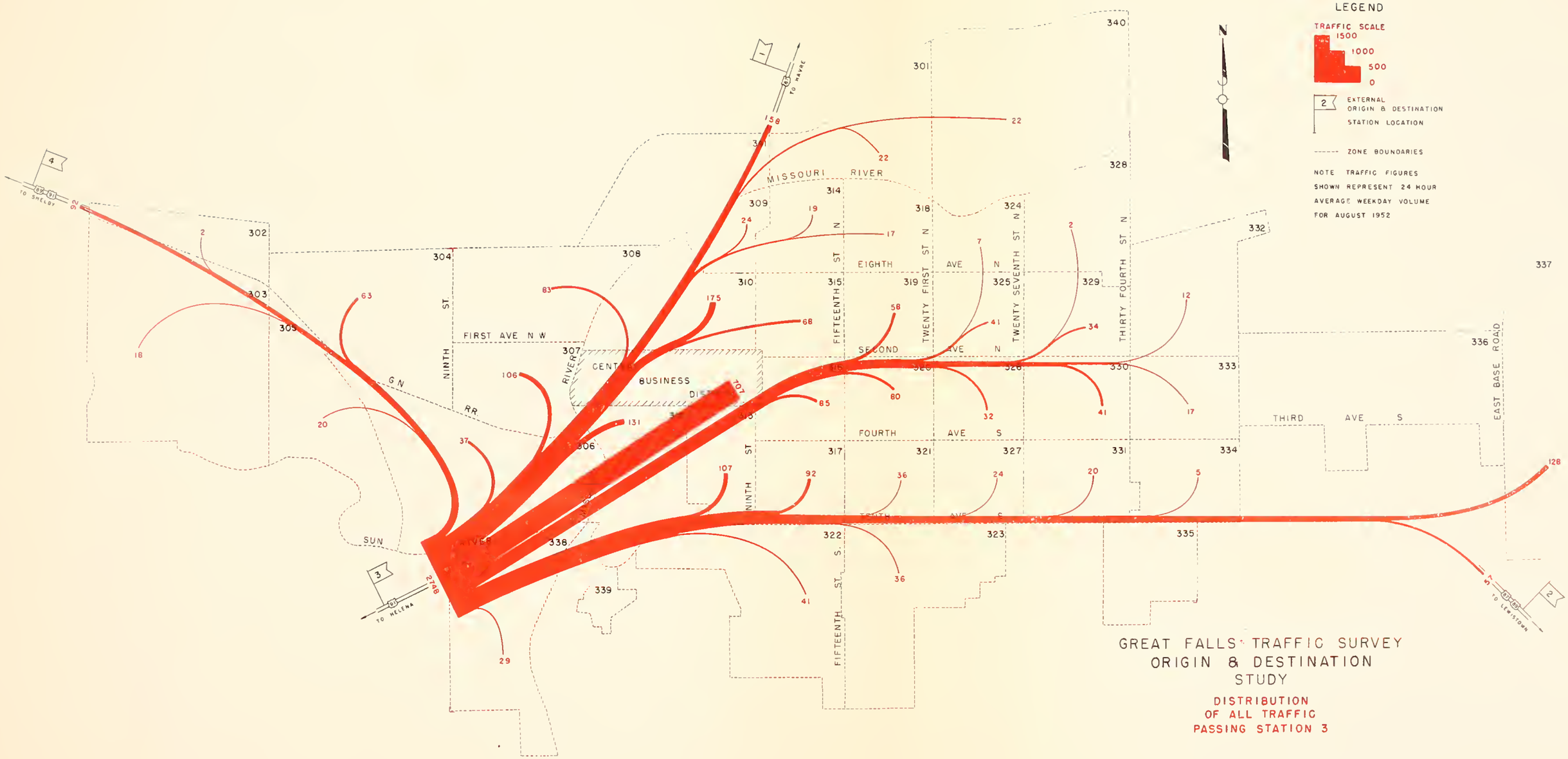
PLATE 22

DISTRIBUTION OF ALL TRAFFIC PASSING STATION 3

The distribution of all traffic passing Station 3 on an average weekday in August of 1952 is shown on Plate 23.

A summary of all traffic at this station follows:

Average Weekday Traffic	2748
Per Cent of Total External Traffic	28.7
Per Cent Commercial Vehicles	6.8
Per Cent to Central Business District	25.7
Per Cent to Other External Stations	11.2



GREAT FALLS TRAFFIC SURVEY
ORIGIN & DESTINATION
STUDY

DISTRIBUTION
OF ALL TRAFFIC
PASSING STATION 3

PLATE 23

DISTRIBUTION OF ALL TRUCKS PASSING STATION 3

The distribution of all trucks larger than a pickup or panel passing Station 3 on an average weekday in August, 1952, is shown on Plate 24.

A summary of commercial traffic at this station follows:

Average Weekday Commercial Traffic	187
Per Cent of Total Commercial Traffic (External)	23.1
Per Cent to Central Business District	27.3
Per Cent to Other External Stations	13.4

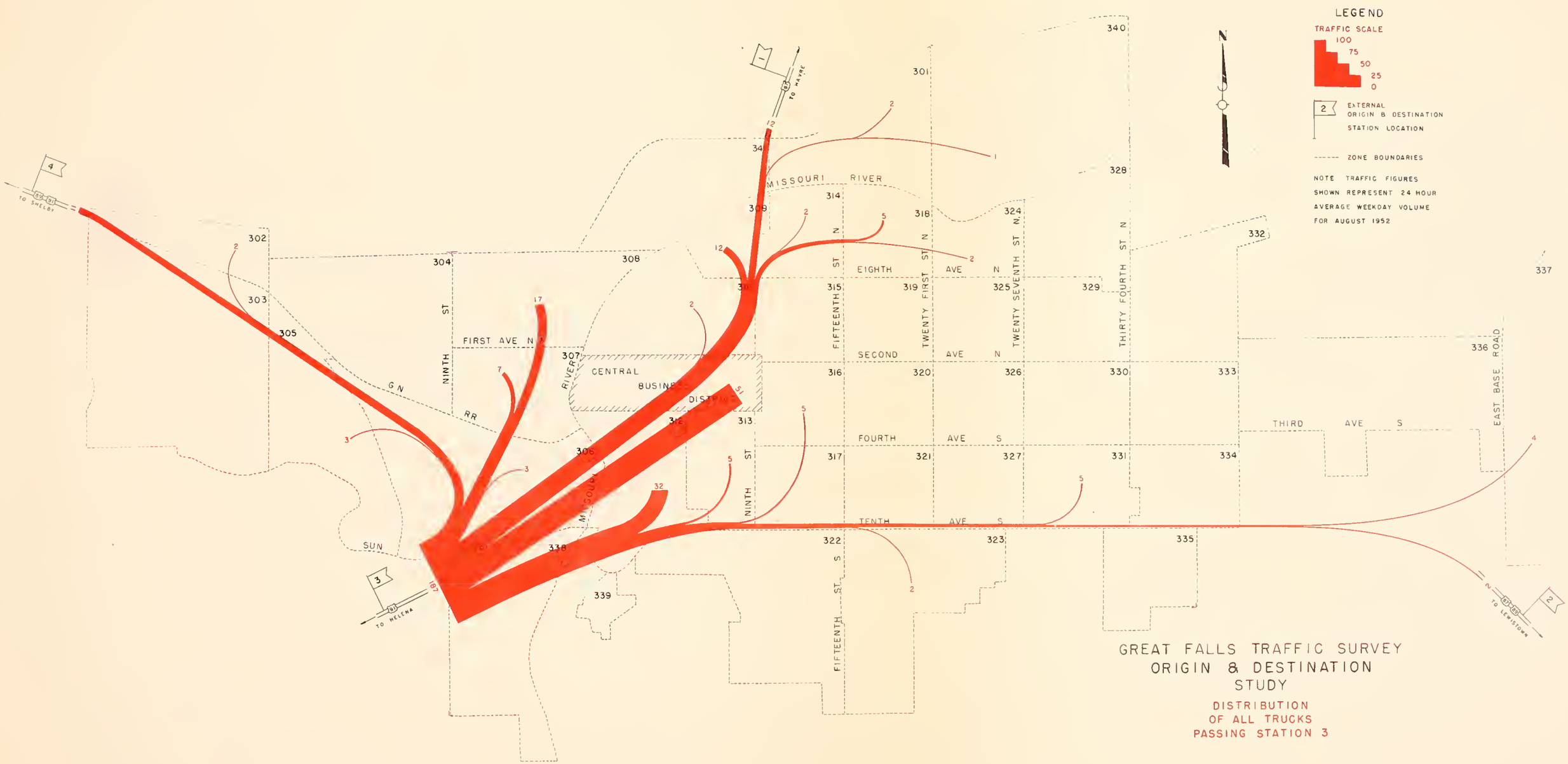

LEGEND
TRAFFIC SCALE
100
75
50
25
0
2 EXTERNAL ORIGIN & DESTINATION STATION LOCATION
ZONE BOUNDARIES
NOTE TRAFFIC FIGURES SHOWN REPRESENT 24 HOUR AVERAGE WEEKDAY VOLUME FOR AUGUST 1952
MISSOURI RIVER
FIRST AVE N
SECOND AVE N
THIRD AVE S
FOURTH AVE S
TENTH AVE S
EIGHTH AVE N
NINTH ST
FIFTEENTH ST
TWENTY FIRST ST N
TWENTY SEVENTH ST N
THIRTY FOURTH ST N
EAST BASE ROAD
CENTRAL BUSINESS DISTRICT
GN RR
SUN RIVER
TO SHELBY
TO HAVRE
TO HELENA
TO LEWISTOWN
GREAT FALLS TRAFFIC SURVEY
ORIGIN & DESTINATION
STUDY
DISTRIBUTION
OF ALL TRUCKS
PASSING STATION 3

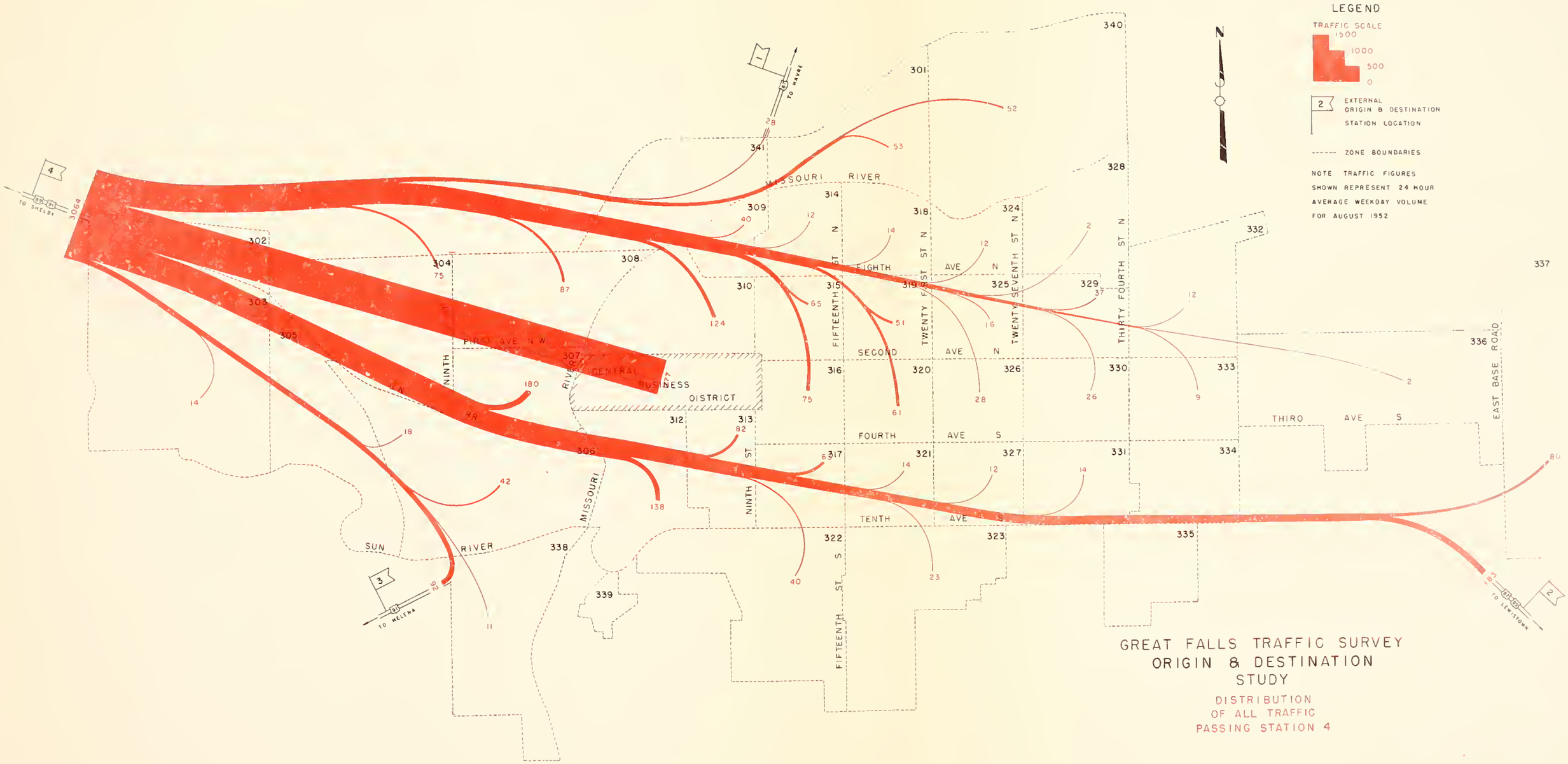
PLATE 24

DISTRIBUTION OF ALL TRAFFIC PASSING STATION 4

The distribution of all traffic passing Station 4 on an average weekday in August of 1952 is shown on Plate 25.

A summary of all traffic at this station follows:

Average Weekday Traffic	3064
Per Cent of Total External Traffic	32.0
Per Cent Commercial Vehicles	10.0
Per Cent to Central Business District	38.4
Per Cent to Other External Stations	9.9



GREAT FALLS TRAFFIC SURVEY
ORIGIN & DESTINATION
STUDY

DISTRIBUTION
OF ALL TRAFFIC
PASSING STATION 4

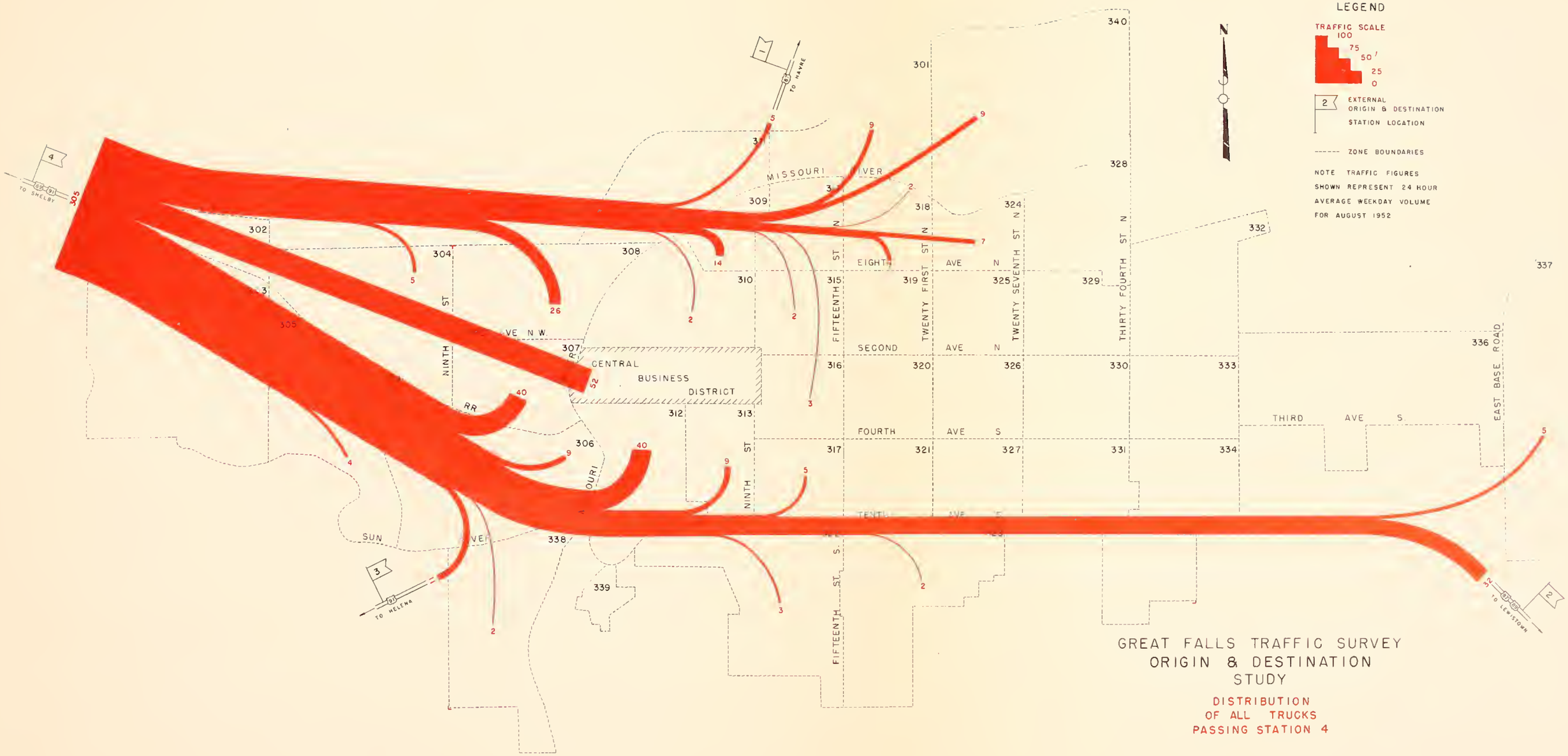
PLATE 25

DISTRIBUTION OF ALL TRUCKS PASSING STATION 4

The distribution of all trucks larger than a pickup or panel passing Station 4 on an average weekday in August, 1952, is shown on Plate 26.

A summary of commercial traffic at this station follows:

Average Weekday Commercial Traffic	305
Per Cent of Total Commercial Traffic (External)	37.6
Per Cent to Central Business District	17.0
Per Cent to Other External Stations	15.7



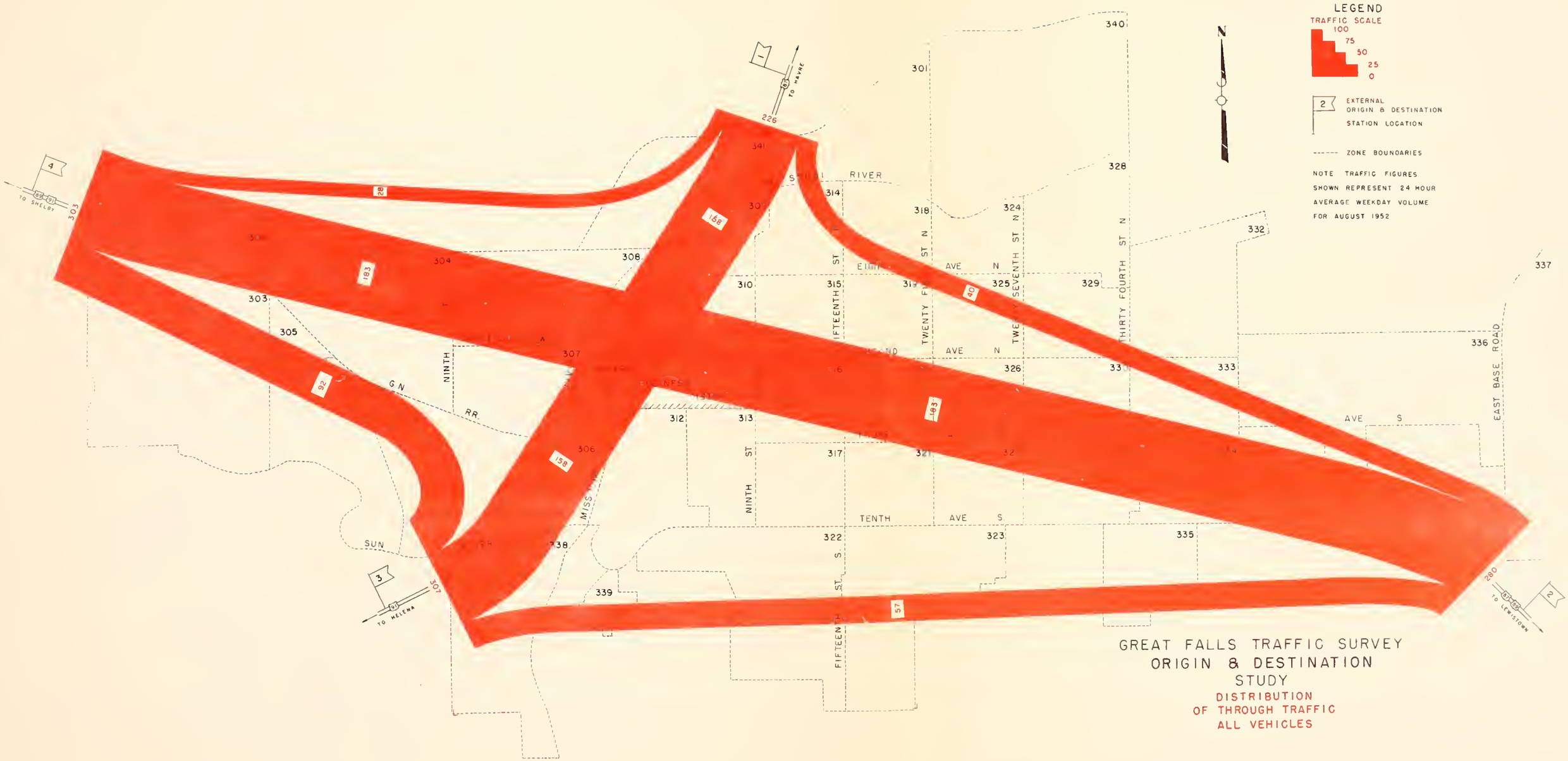
GREAT FALLS TRAFFIC SURVEY
ORIGIN & DESTINATION
STUDY

DISTRIBUTION
OF ALL TRUCKS
PASSING STATION 4

PLATE 26

DISTRIBUTION OF THROUGH TRAFFIC--ALL VEHICLES

Plate 27 illustrates the desire lines of traffic that did not stop in the city. All vehicles at all stations have been included and traffic volumes have been adjusted to an average weekday in August of 1952.

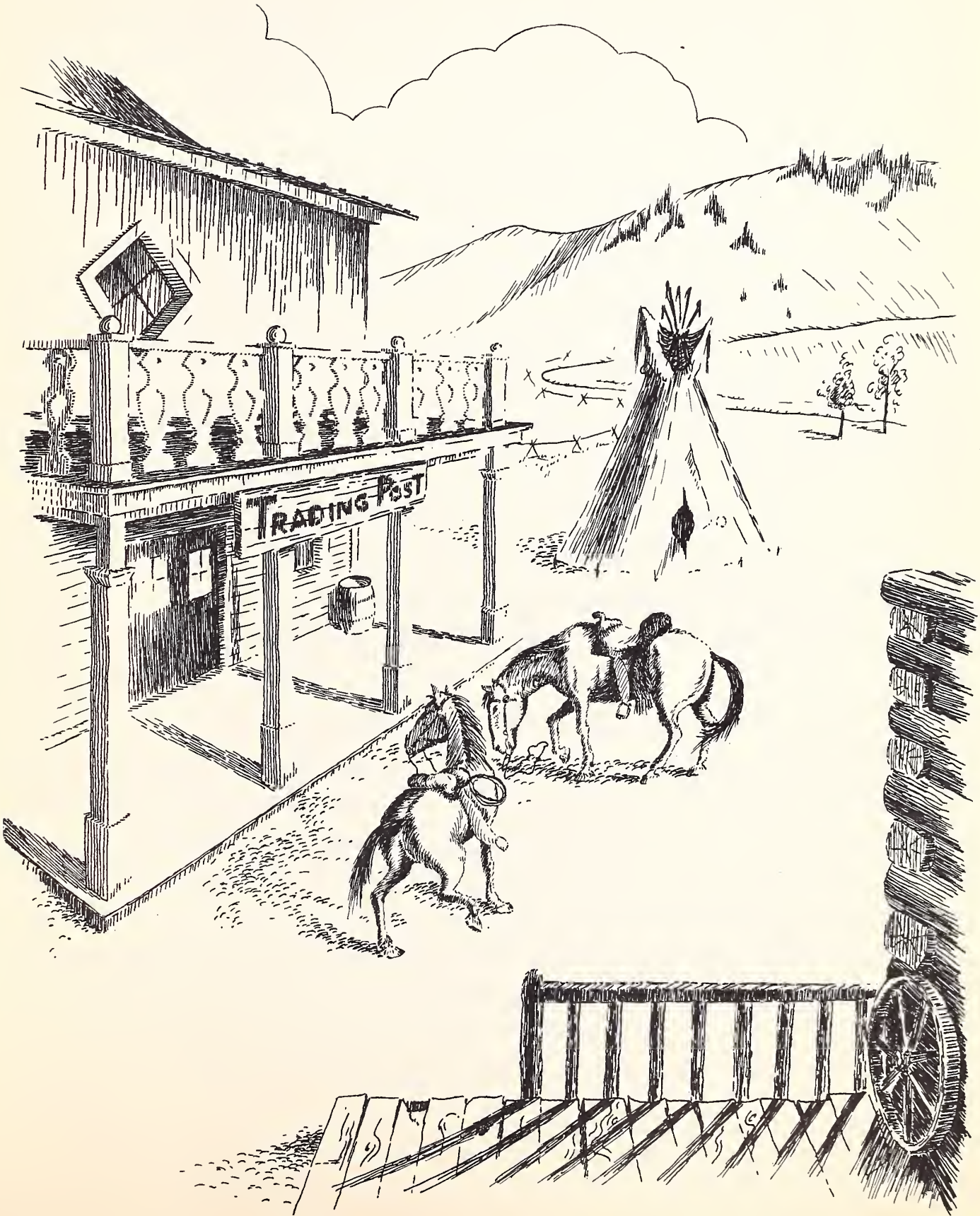


GREAT FALLS TRAFFIC SURVEY
ORIGIN & DESTINATION
STUDY
DISTRIBUTION
OF THROUGH TRAFFIC
ALL VEHICLES

PLATE 27

Part Four

Parking Study



PARKING STUDY

The parking problem in most cities has long been the neglected stepchild of transportation. It has only been in recent years, however, that the full impact of limited curb parking space and inadequate off-street parking has been brought home to local merchants who have been conducting business for years in the central business districts of larger cities. The signs of inadequate parking become evident in a gradual decentralization of business to the suburban areas and a consequent loss of customers to the merchants in the downtown areas. If this trend is allowed to continue, it can produce grave consequences in any city.

In an effort to determine just how critical the parking problem has become in Great Falls, a study was conducted of the supply, demand, and general characteristics of parking in the central business district.

Although the inner cordon origin and destination survey was not designed primarily as a parking study, it was considered feasible to add certain questions concerning parking to the interview form and thus gain some useful data on length of time parked and type of parking used. This information, combined with trip origins, trip purposes, and sample checks on parking turnover, has been tabulated and assembled into a streamlined parking survey.

PARKING SUPPLY

An inventory of all parking spaces in the central business district revealed a total of 3,888 available spaces divided as follows:

METERED CURB	UNMETERED CURB	LOTS	GARAGES	TOTAL
1,121	917	1,650	200	3,888

PARKING DEMAND

On an average weekday in July, during the critical parking hours of 10 A.M. to 6 P.M., 26,471 vehicles left the inner cordon area, and 18,195 drivers, or 69%, were interviewed. 52% of them said that they would have liked to park in a 15 block area. The post office and Federal Building block was given the most times in answer to questioning regarding their origin.

The following tabulation was compiled from the parking data obtained in conjunction with the origin and destination study:

TRIP PURPOSE	PER CENT	AVERAGE TIME PARKED					
		CURB		OFF-STREET		ALL PARKING	
		HOURS	MINUTES	HOURS	MINUTES	HOURS	MINUTES
Work or Business	58		58	2	48	1	47
Shopping	16		37		50		41
Eat Meal	6		51	2	20	1	18
Social or Recreational	12	1	6	2	19	1	23
Medical	1	1	2	2	19	1	17
Other	7	1	22	3	7	1	58
All purposes	100		57	2	28	1	33

38% of the trips for all purposes used off-street parking.

In accordance with suggestions received from Mr. Burrage of the Bureau of Public roads, all weekday manual counts made in conjunction with the interviews were analyzed to determine the weekday peak hour of vehicle accumulation within the cordon area. Manual directional counts at all cordon stations were also taken on Saturday in order that a comparison of the two peak hours of accumulation might be made. On both weekdays and Saturday the peak hour of accumulation was determined to be between 10 and 11 A.M. A spot count was then made of all vehicles parked within the area on a Friday and a Saturday during the peak hour. A comparison of the two counts follows:

NUMBER OF VEHICLES PARKED IN AREA

	CURBS	LOTS	GARAGES	ALLEYS, SERVICE STATIONS, ETC.	TOTAL
Friday	1,342	1,190	85	668	3,285
Saturday	1,267	1,104	79	647	3,097

Curb, lot, and garage space was filled to 67% of capacity on Friday and 63% on Saturday These percentage figures based on the entire 48 block area would seem to indicate that the parking situation is not too acute. In a fifteen block area, however, all available curb space was filled on Friday and there were 65 additional vehicles illegally parked in end zones, fire plugs, and theater entrances. The scope of this illegal curb parking, combined with the number of vehicles found parked in alleys and other informal parking areas, points to a critical parking problem in the core of the business district. This problem will be further aggravated if the present angle parking is changed to parallel on Central Avenue. It is therefore necessary that a minimum of 200 additional parking spaces be provided in the core of the

business district to provide for immediate needs.

Plate 29 graphically illustrates the accumulation of vehicles in the central business district by hours from 6 A.M. to 6 P.M. on an average weekday. The vehicle accumulation, which is indicative of parking demand, remains quite constant during the hours of 9 A.M. to 4:30 P.M. and does not drop substantially below the peak hour of 10 to 11 A.M.

PARKING TURNOVER

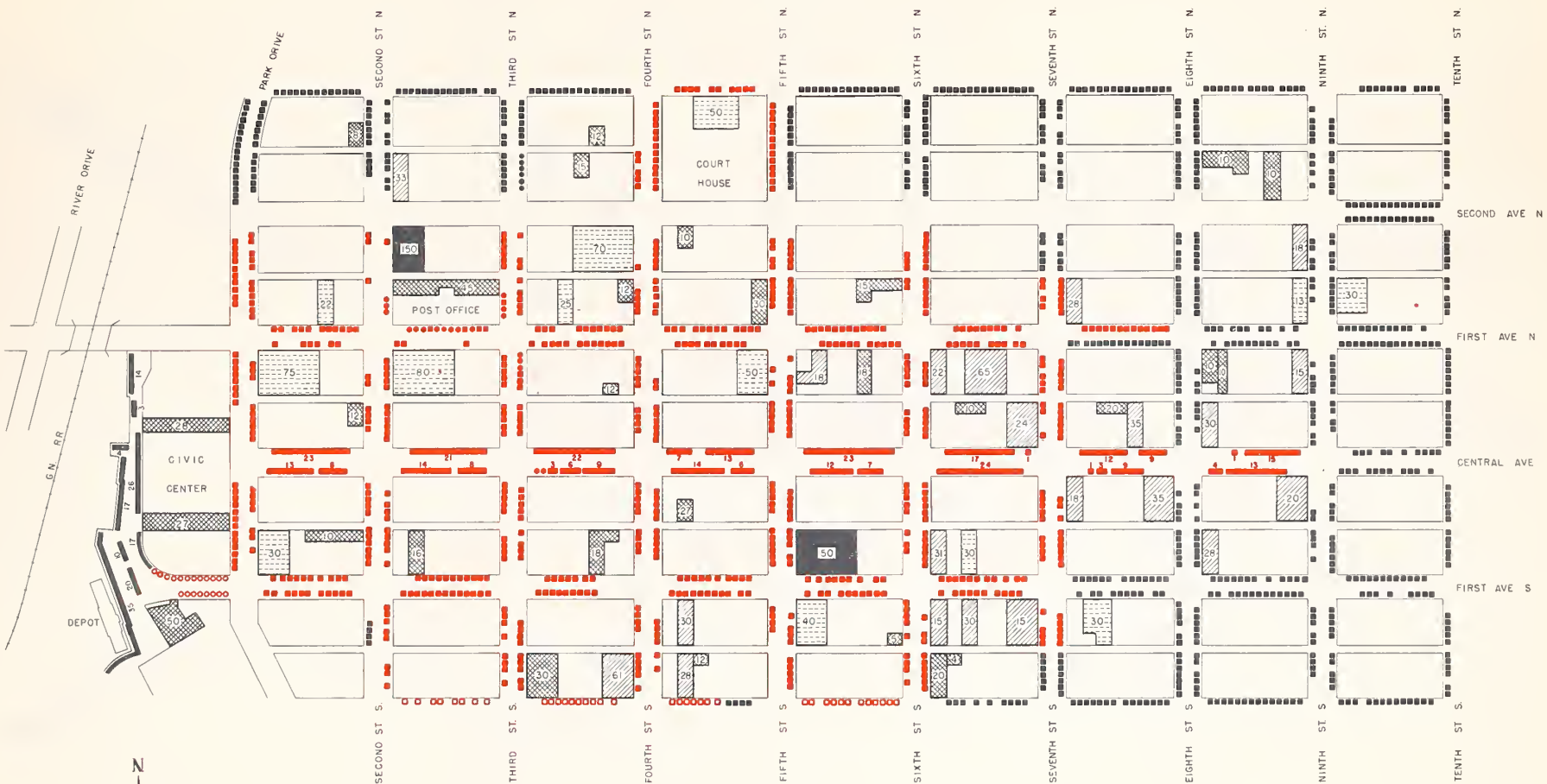
An 8-hour check (10 A.M. to 6 P.M.) was made of the parking turnover at the curb on four representative blocks in the business district. Two of the blocks faced Central Avenue where parking demand was the heaviest, and the other two were one block north and south of Central Avenue.

Data on the parking turnover for each block were compiled by having a recorder inventory the vehicles parked at the curb and note license numbers every fifteen minutes from 10 A.M. to 6 P.M. By this method the parking turnover was determined, as well as related facts such as number of meter violations, number of parking violations, etc. The results of this survey are compiled on Plates 34-37, inclusive.

It is interesting to note that the turnover on Central Avenue in both blocks was less than on the side streets. One of the most important facts developed by this study was that an average of only 18% of the total vehicles observed parked for over one hour, but they used 48% of the available space hours. Thus, if the one-hour curb parking restrictions now in effect were more vigorously enforced, it would be possible to park 925 more vehicles at the curb in the four blocks that were surveyed.

GREAT FALLS TRAFFIC SURVEY
LOCATION AND PARKING CAPACITY
OF STREETS, LOTS AND GARAGES

AS OF JULY 1953



LEGEND

OFF STREET PARKING

- PUBLIC LOTS
- PRIVATE LOTS
- CUSTOMER LOTS
- PUBLIC GARAGES

STREET-FREE PARKING

- UNRESTRICTED
- UNRESTRICTED ANGLE (17)
- 5 MINUTES

STREET-METERED PARKING

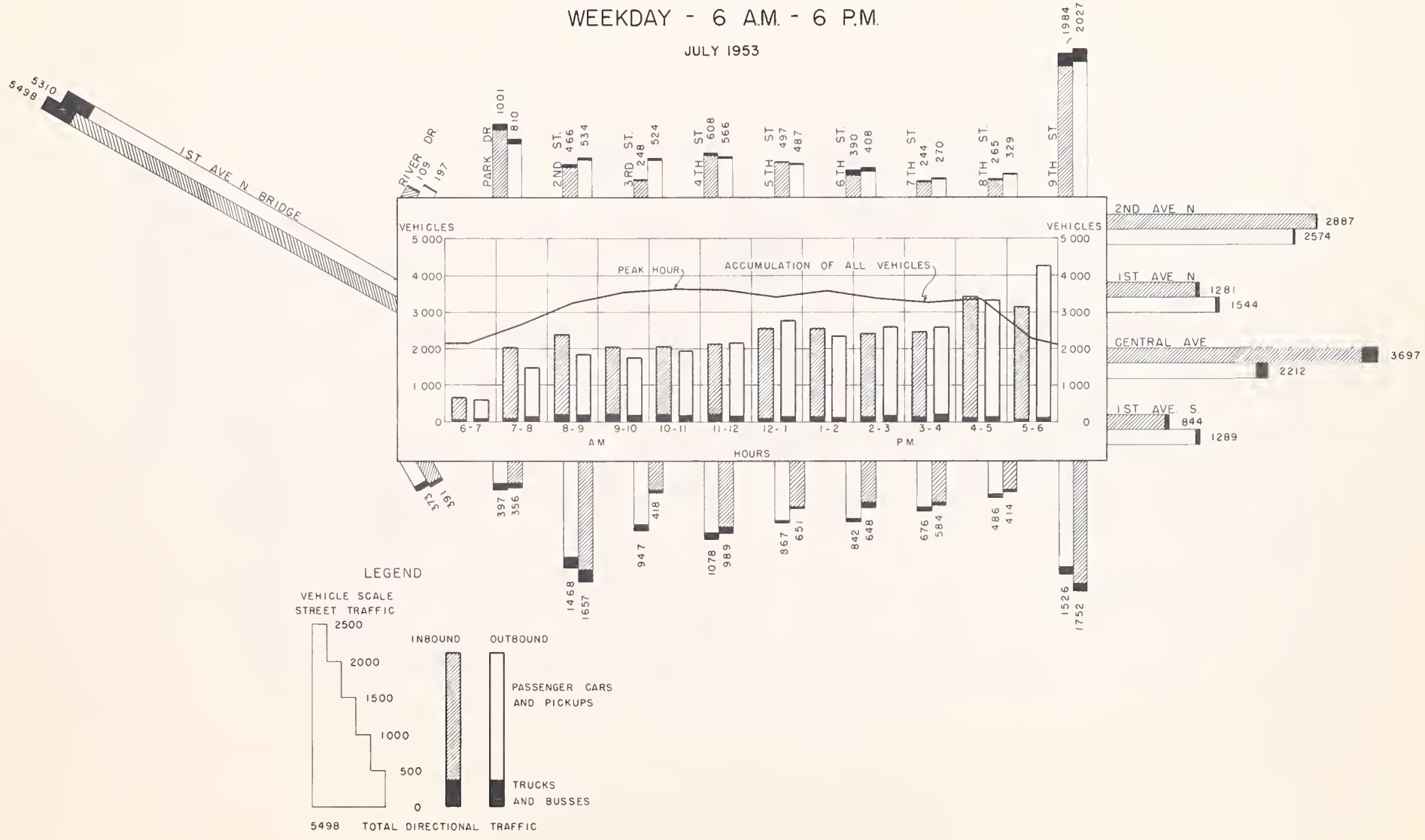
- 1 HOUR
- 1 HOUR ANGLE (20)
- 2 HOUR
- 5 HOUR
- 12 MINUTES

NOTE: NUMBERS SHOW CAPACITY OF LOTS, GARAGES AND ANGLE STREET PARKING.

PLATE 28

GREAT FALLS TRAFFIC SURVEY
NUMBER OF VEHICLES ENTERING OR LEAVING CENTRAL BUSINESS DISTRICT
WEEKDAY - 6 A.M. - 6 P.M.

JULY 1953

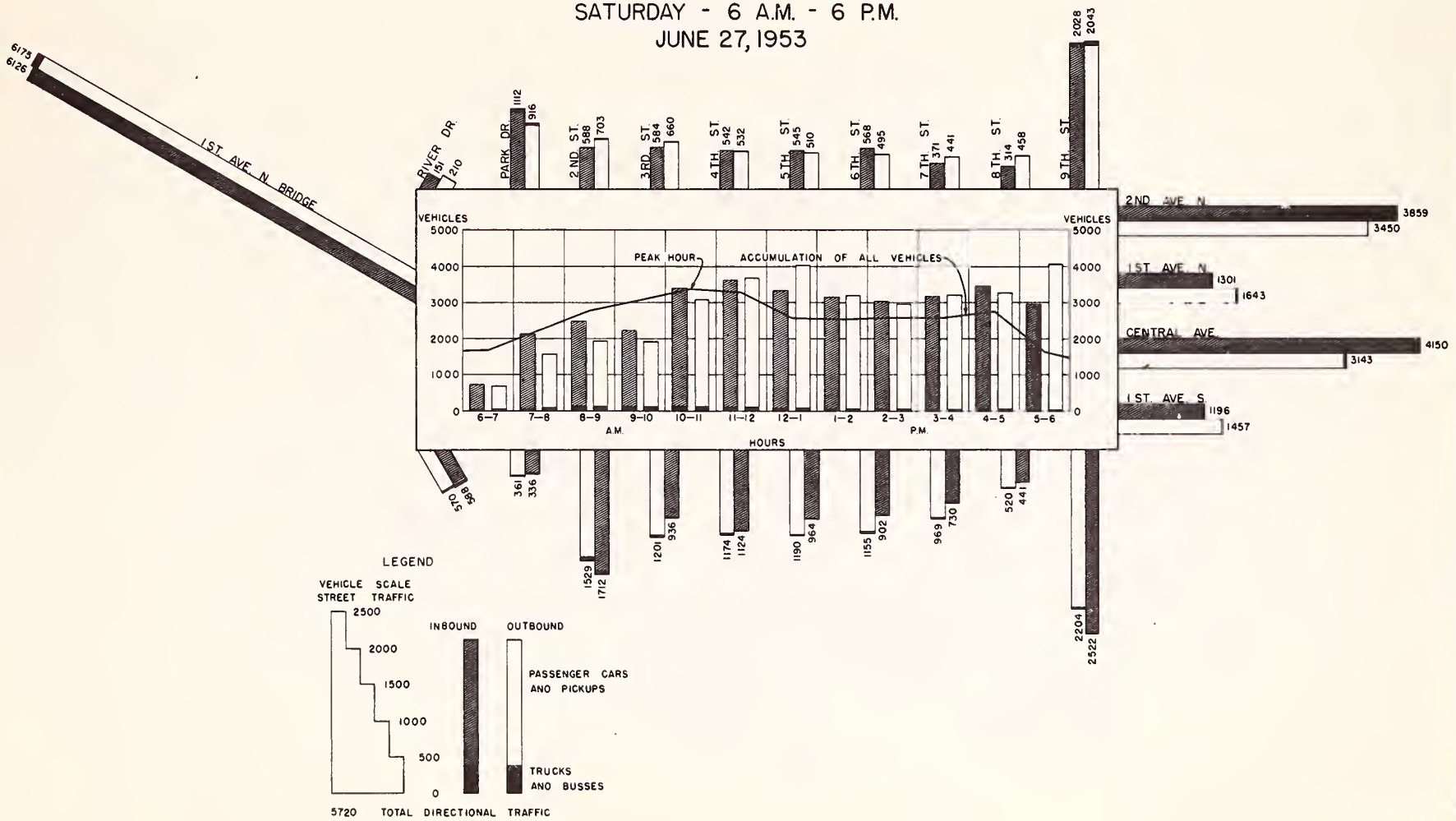


LEGEND

PLATE 29

PLATE 30

GREAT FALLS TRAFFIC SURVEY
NUMBER OF VEHICLES ENTERING OR LEAVING CENTRAL BUSINESS DISTRICT
SATURDAY - 6 A.M. - 6 P.M.
JUNE 27, 1953



GREAT FALLS TRAFFIC SURVEY
CURB SPACE OCCUPANCY
PEAK HOUR - 10:00 TO 11:00 A.M.
FRIDAY - JULY 1953

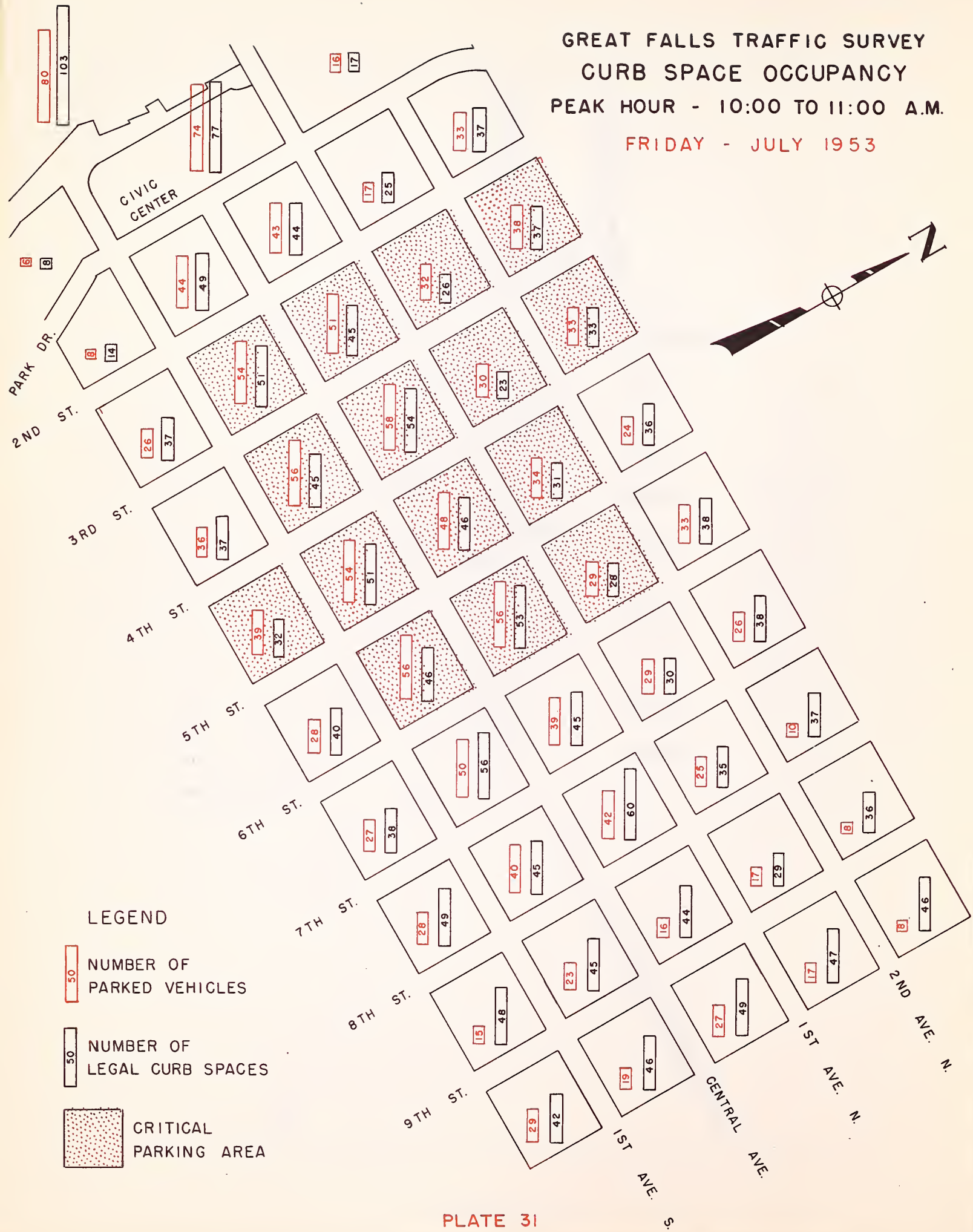


PLATE 31

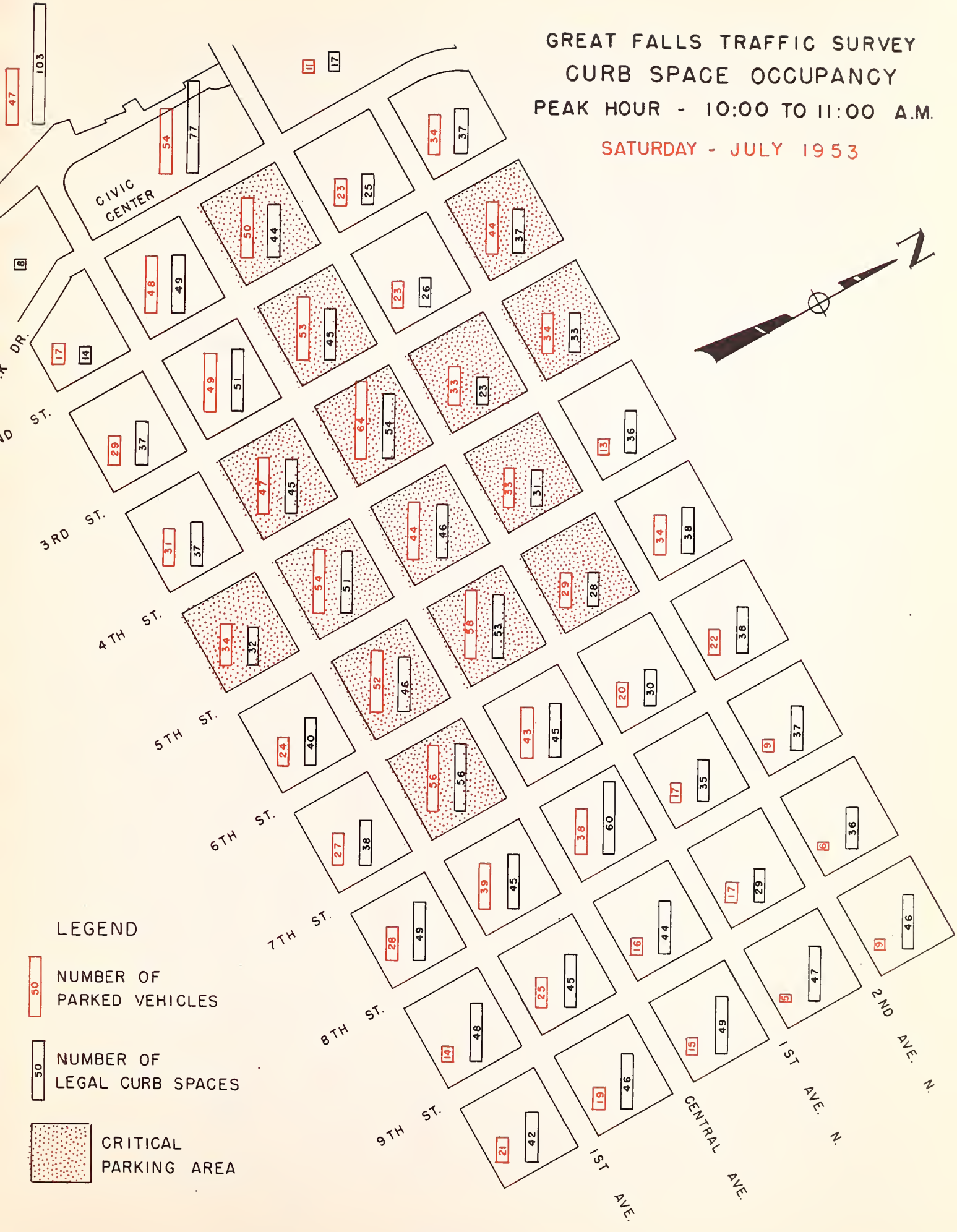

GREAT FALLS TRAFFIC SURVEY
CURB SPACE OCCUPANCY
PEAK HOUR - 10:00 TO 11:00 A.M.
SATURDAY - JULY 1953
N
CIVIC CENTER
3RD ST.
4TH ST.
5TH ST.
6TH ST.
7TH ST.
8TH ST.
9TH ST.
1ST AVE. S.
CENTRAL AVE.
1ST AVE. N.
2ND AVE. N.
LEGEND
50 NUMBER OF PARKED VEHICLES
50 NUMBER OF LEGAL CURB SPACES
CRITICAL PARKING AREA

PLATE 32

GREAT FALLS TRAFFIC SURVEY
PARKING DEMAND
AVERAGE WEEKDAY
10:00 A.M. TO 6:00 P.M.
INNER-CORDON TRAFFIC

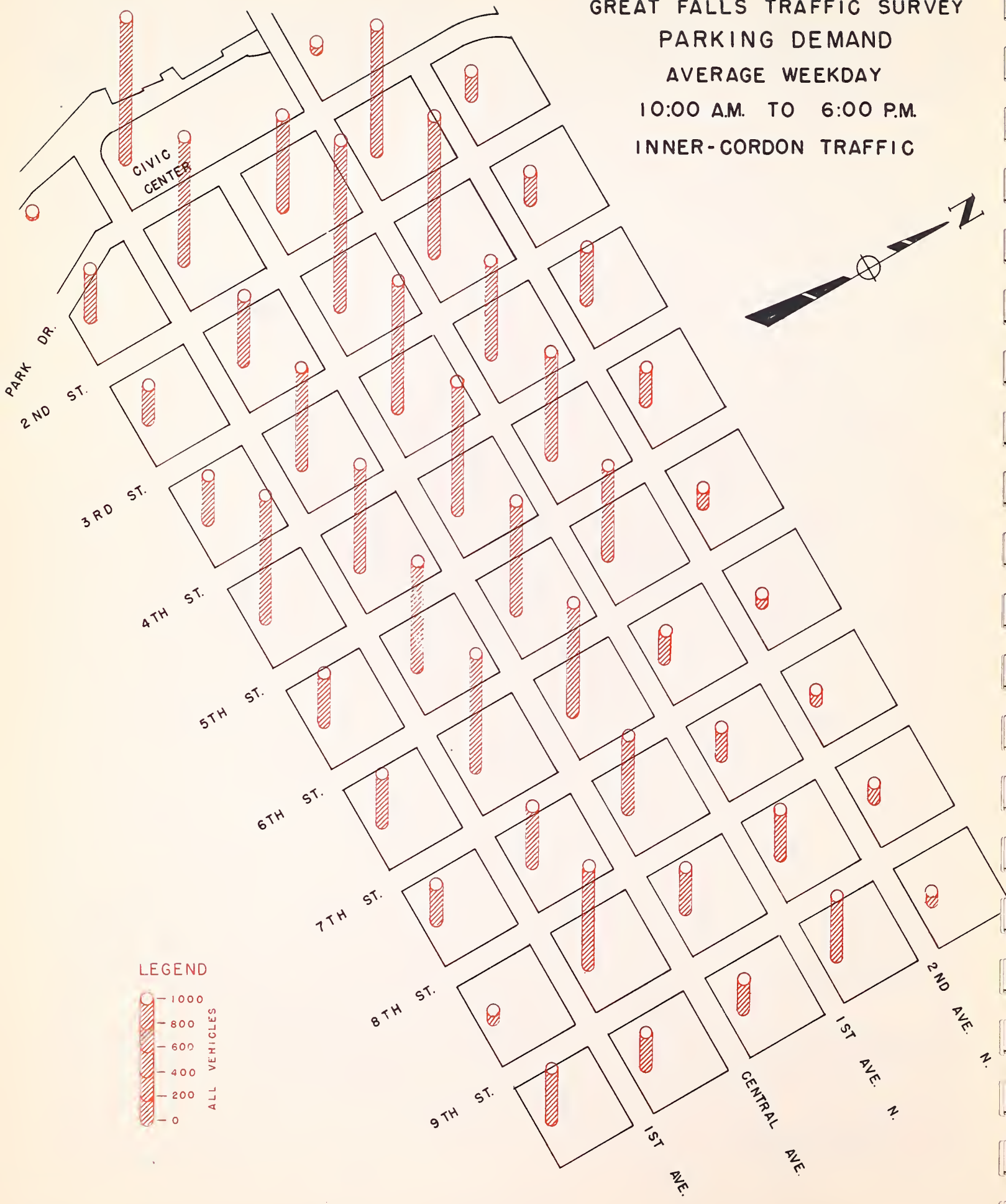
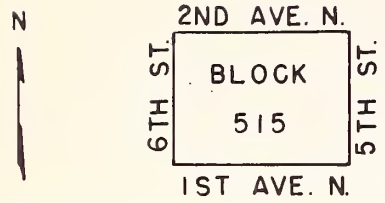


PLATE 33

GREAT FALLS TRAFFIC SURVEY
CURB PARKING CHARACTERISTICS
CENTRAL BUSINESS DISTRICT
10 A.M. - 6 P.M.



BLOCK 515

	NORTH FACE 2ND AVE. N.	EAST FACE 5TH ST.	SOUTH FACE 1ST AVE. S.	WEST FACE 4TH ST.	TOTALS
NUMBER OF 1 HOUR METERS	NO PARKING	5	12	11	28
NUMBER OF 12 MINUTE METERS					
NUMBER OF VEHICLES PARKED IN LEGAL SPACES (1 HOUR METERS)		40	130	96	266
AVERAGE TIME PARKED (MINUTES) (1 HOUR METERS)		44.2	41.5	43.4	43.0
NUMBER OF VEHICLES PARKED IN LEGAL SPACES (12 MINUTE METERS)					
AVERAGE TIME PARKED (MINUTES) (12 MINUTE METERS)					
TOTAL SPACE HOURS AVAILABLE (ALL METERS)		40	96	88	224
SPACE HOURS USED (ALL METERS)		29.50	90.00	69.50	189.00
PERCENT OF AVAILABLE SPACE HOURS USED		73.7	93.7	79.0	84.4
NUMBER OF VEHICLES PARKED OVER 1 HOUR		5	16	17	38
NUMBER OF VEHICLES PARKED ILLEGALLY (END ZONES, FIRE PLUGS, DOUBLE PARK ETC.)	2	5	5	6	18
HOURS OF ILLEGAL PARKING	1.0	1.50	3.00	1.50	7.00
NUMBER OF METER VIOLATIONS		9	26	30	65
HOURS OF METER VIOLATIONS		6.50	16.50	18.75	41.75
PERCENT OF VEHICLES PARKING OVER 1 HOUR (ALL METERS)		12.5	12.3	17.7	14.3
PERCENT OF SPACE HOURS USED BY VEHICLES PARKING OVER 1 HOUR		36.4	36.1	44.6	39.3
PARKING TURNOVER (10 A.M. - 6 P.M.) (VEHICLES / SPACE / DAY)		8.0	10.8	8.7	9.5

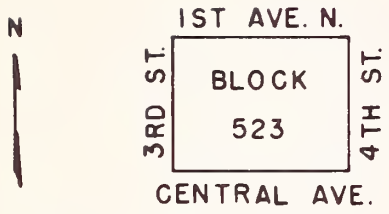
DURATION OF PARKING

PERCENT OF TOTAL VEHICLES PARKED

15 MINUTES OR LESS	35.0	39.2	37.5	38.0
16 TO 30 MINUTES	22.5	20.0	19.8	20.3
31 MINUTES TO 1 HOUR	30.0	28.5	25.0	27.4
61 MINUTES TO 2 HOURS	7.5	9.2	15.6	11.3
OVER 2 HOURS	5.0	3.1	2.1	3.0
MAXIMUM TIME PARKED HOURS	3.50	6.25	5.25	6.25

PLATE 34

GREAT FALLS TRAFFIC SURVEY
CURB PARKING CHARACTERISTICS
CENTRAL BUSINESS DISTRICT
10 A.M. - 6 P.M.



BLOCK 523

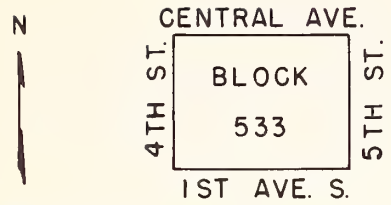
	NORTH FACE 1ST AVE. N.	EAST FACE 4TH ST.	SOUTH FACE CENTRAL AVE.	WEST FACE 3RD ST.	TOTALS
NUMBER OF 1 HOUR METERS	12	9	22	8	51
NUMBER OF 12 MINUTE METERS				3	3
NUMBER OF VEHICLES PARKED IN LEGAL SPACES (1 HOUR METERS)	107	85	193	73	458
AVERAGE TIME PARKED (MINUTES) (1 HOUR METERS)	49.5	47.6	52.7	48.5	50.3
NUMBER OF VEHICLES PARKED IN LEGAL SPACES (12 MINUTE METERS)				46	46
AVERAGE TIME PARKED (MINUTES) (12 MINUTE METERS)				26.4	26.4
TOTAL SPACE HOURS AVAILABLE (ALL METERS)	96	72	176	88	432
SPACE HOURS USED (ALL METERS)	88.25	67.50	169.50	79.25	404.50
PERCENT OF AVAILABLE SPACE HOURS USED	91.9	93.8	96.3	90.1	93.6
NUMBER OF VEHICLES PARKED OVER 1 HOUR	25	19	47	13	104
NUMBER OF VEHICLES PARKED ILLEGALLY (END ZONES, FIRE PLUGS, DOUBLE PARK ETC.)	18	11	19	13	61
HOURS OF ILLEGAL PARKING	8.5	3.25	7.25	4.25	23.25
NUMBER OF METER VIOLATIONS	5	7	17	10	39
HOURS OF METER VIOLATIONS	2.75	6.75	8.50	8.00	26.00
PERCENT OF VEHICLES PARKING OVER 1 HOUR (ALL METERS)	23.4	22.4	24.4	10.9	20.6
PERCENT OF SPACE HOURS USED BY VEHICLES PARKING OVER 1 HOUR	56.2	54.5	58.1	48.3	52.0
PARKING TURNOVER (10 A.M. - 6 P.M.) (VEHICLES / SPACE / DAY)	8.9	9.4	8.8	10.8	9.3

DURATION OF PARKING

PERCENT OF TOTAL VEHICLES PARKED

15 MINUTES OR LESS	29.0	34.1	29.5	51.3	35.3
16 TO 30 MINUTES	25.2	21.2	21.8	17.6	21.4
31 MINUTES TO 1 HOUR	22.4	22.4	24.4	20.2	22.6
61 MINUTES TO 2 HOURS	17.8	17.6	16.1	5.0	14.1
OVER 2 HOURS	5.6	4.7	8.3	5.9	6.5
MAXIMUM TIME PARKED HOURS	4.50	3.50	6.50	7.25	7.25

GREAT FALLS TRAFFIC SURVEY
CURB PARKING CHARACTERISTICS
CENTRAL BUSINESS DISTRICT
10 A.M. - 6 P.M.



BLOCK 533

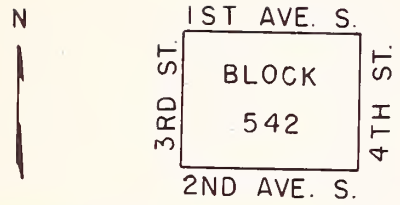
	NORTH FACE CENTRAL AVE.	EAST FACE 5TH ST.	SOUTH FACE 1ST AVE. S.	WEST FACE 4TH ST.	TOTALS
NUMBER OF 1 HOUR METERS	20	11	10	10	51
NUMBER OF 12 MINUTE METERS					
NUMBER OF VEHICLES PARKED IN LEGAL SPACES (1 HOUR METERS)	161	111	102	93	467
AVERAGE TIME PARKED (MINUTES) (1 HOUR METERS)	57.5	45.4	44.6	49.2	50.1
NUMBER OF VEHICLES PARKED IN LEGAL SPACES (12 MINUTE METERS)					
AVERAGE TIME PARKED (MINUTES) (12 MINUTE METERS)					
TOTAL SPACE HOURS AVAILABLE (ALL METERS)	160	88	80	80	408
SPACE HOURS USED (ALL METERS)	154.25	84.00	75.75	76.25	390.25
PERCENT OF AVAILABLE SPACE HOURS USED	96.4	95.5	94.7	95.3	95.6
NUMBER OF VEHICLES PARKED OVER 1 HOUR	41	16	18	20	95
NUMBER OF VEHICLES PARKED ILLEGALLY (END ZONES, FIRE PLUGS, DOUBLE PARK ETC.)	16	2	10	9	37
HOURS OF ILLEGAL PARKING	3.75	0.50	2.50	8.25	15.00
NUMBER OF METER VIOLATIONS	26	20	19	16	81
HOURS OF METER VIOLATIONS	23.25	11.50	11.00	14.00	59.75
PERCENT OF VEHICLES PARKING OVER 1 HOUR (ALL METERS)	25.5	14.4	17.7	21.5	20.3
PERCENT OF SPACE HOURS USED BY VEHICLES PARKING OVER 1 HOUR	66.1	44.6	46.9	53.8	55.3
PARKING TURNOVER (10 A.M. - 6 P.M.) (VEHICLES / SPACE / DAY)	8.1	10.1	10.2	9.3	9.2

DURATION OF PARKING

PERCENT OF TOTAL VEHICLES PARKED

15 MINUTES OR LESS	42.2	36.9	38.2	36.6	39.0
16 TO 30 MINUTES	14.9	22.6	21.6	20.4	19.3
31 MINUTES TO 1 HOUR	17.4	26.1	22.5	21.5	21.4
61 MINUTES TO 2 HOURS	14.3	9.0	11.8	15.1	12.6
OVER 2 HOURS	11.2	5.4	5.9	6.4	7.7
MAXIMUM TIME PARKED HOURS	8.00	8.00	3.00	5.50	8.00

GREAT FALLS TRAFFIC SURVEY
CURB PARKING CHARACTERISTICS
CENTRAL BUSINESS DISTRICT
10 A.M. - 6 P.M.



BLOCK 542

	NORTH FACE 1ST AVE. S.	EAST FACE 4TH ST.	SOUTH FACE 2ND AVE. S	WEST FACE 3RD ST.	TOTALS
NUMBER OF 1 HOUR METERS	9	9	10	9	37
NUMBER OF 12 MINUTE METERS					
NUMBER OF VEHICLES PARKED IN LEGAL SPACES (1 HOUR METERS)	115	86	71	71	343
AVERAGE TIME PARKED (MINUTES) (1 HOUR METERS)	34.9	45.0	39.3	40.4	39.5
NUMBER OF VEHICLES PARKED IN LEGAL SPACES (12 MINUTE METERS)					
AVERAGE TIME PARKED (MINUTES) (12 MINUTE METERS)					
TOTAL SPACE HOURS AVAILABLE (ALL METERS)	72	72	80	72	296
SPACE HOURS USED (ALL METERS)	67.00	64.50	46.50	47.75	225.75
PERCENT OF AVAILABLE SPACE HOURS USED	93.1	89.6	58.1	66.3	76.3
NUMBER OF VEHICLES PARKED OVER 1 HOUR	11	10	12	9	42
NUMBER OF VEHICLES PARKED ILLEGALLY (END ZONES, FIRE PLUGS, DOUBLE PARK ETC.)	17	11	1	5	34
HOURS OF ILLEGAL PARKING	8.00	3.75	0.25	3.50	15.50
NUMBER OF METER VIOLATIONS	8	9	4	10	31
HOURS OF METER VIOLATIONS	6.00	12.00	1.50	8.00	27.5
PERCENT OF VEHICLES PARKING OVER 1 HOUR (ALL METERS)	9.6	11.6	16.9	12.6	12.2
PERCENT OF SPACE HOURS USED BY VEHICLES PARKING OVER 1 HOUR	35.4	45.0	41.9	41.4	40.8
PARKING TURNOVER (10 A.M. - 6 P.M.) (VEHICLES / SPACE / DAY)	12.8	9.6	7.1	7.9	9.3

DURATION OF PARKING

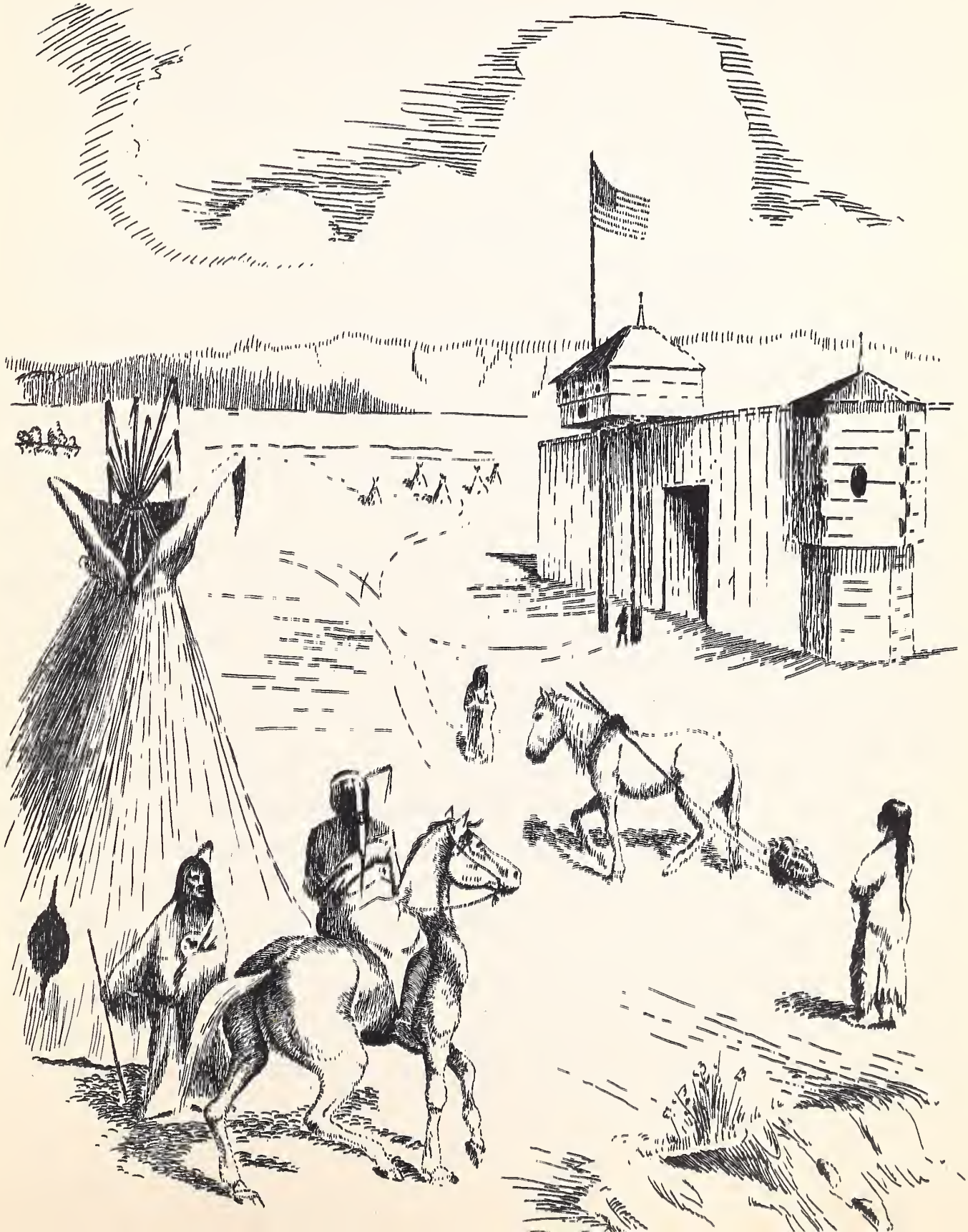
PERCENT OF TOTAL VEHICLES PARKED

15 MINUTES OR LESS	58.2	38.4	38.0	42.3	45.8
16 TO 30 MINUTES	13.9	30.2	28.2	26.8	23.6
31 MINUTES TO 1 HOUR	18.3	19.8	16.9	18.3	18.4
61 MINUTES TO 2 HOURS	6.1	5.8	14.1	7.0	7.9
OVER 2 HOURS	3.5	5.8	2.8	5.6	4.3
MAXIMUM TIME PARKED HOURS	4.75	6.00	2.75	3.50	6.00

PLATE 37

Part Five

Urban Route Analyses



URBAN ROUTE ANALYSIS

The urban routes that are analyzed in this report are four of the more heavily traveled arterials in Great Falls. Basically, these analyses are a study of the street intersection capacities along each route and the various factors relating to traffic capacities. The methods used in determining the practical traffic capacity for each intersection are detailed in the *Highway Capacity Manual* published by the Bureau of Public Roads. The traffic volumes used are weekday peak hour volumes which have been adjusted to a design volume corresponding to the 30th maximum hour. Accident data were taken from the City Police Department's files for the period of July 1, 1952, to June 30, 1953.

CENTRAL AVENUE

Plate 38 illustrates the existing conditions on Central Avenue with angle parking. Due to the extremely high accident rate, a special analysis of all accidents occurring on this section is made on Plate 40. It will be noted that 93 out of a total of 209 accidents can be charged directly to some form of parking maneuver. The shaded areas on Plate 38 indicate the sections that are now operating above practical traffic capacity due principally to the use of angle parking. This practice reduces the usable street width by 20 feet and the traffic capacity by at least 40%.

Plate 39 presents the practical traffic capacity of Central Avenue if a change was made to parallel parking. All other data on this plate are the same as on Plate 38. If the recommended changeover from angle to parallel parking is made and four traffic lanes are established, the additional traffic capacity thus gained should be ample to accommodate future traffic volumes until 1965 - 1970 with very little congestion.

SECOND AVENUE NORTH

Plates 41-43 analyze the existing conditions found on Second Avenue North from Park Drive to the east city limits at 38th Street. The accident rate shown has been computed for the period of July 1, 1952, to June 30, 1953. Since the No Parking Ordinance was put into effect in the Spring of 1953, the accident rate has dropped sharply from Park Drive to Ninth Street. The No Parking Ordinance has also increased the traffic capacity of this section sufficiently so that it now adequately carries the present traffic and will probably function without too much congestion

until 1960-1965. The section from Ninth to Fifteenth Streets is operating above capacity. In order to alleviate this condition, it is recommended that Second Avenue North be placed in one-way operation for westbound traffic as part of a one-way couplet with First Avenue North from Park Drive to Fifteenth Street. The alternates to this recommendation are that the avenue be widened by removal of the outside boulevard, or parking be prohibited from Ninth to Fifteenth Streets. Six blocks between 32nd and 38th Streets are now operating above capacity due primarily to substandard design. The 21-foot surfacing on this section should be widened to the curb-to-curb width of 34 feet. The proposed surface widening will increase the traffic capacity of this section enough to provide for normal anticipated growth until 1960-1965. In the event of any large scale expansion of the Air Force Base taking place, it is possible that it will be necessary to extend the proposed one-way street system on First and Second Avenues North to 38th Street.

FIRST AVENUE NORTH

Plate 44 indicates a critical section exists on First Avenue North from Park Drive to Fifth Street. The high accident rate and comparatively low over-all speeds even during off-peak hours attest to the general congestion found in these four blocks. From Fifth to Fifteenth Streets the avenue is adequate to handle the present traffic load plus any normal increase in the foreseeable future.

It is recommended that this avenue be placed in one-way operation carrying eastbound traffic from Park Drive to the vicinity of Fifteenth Street.

NINTH STREET

Ninth Street is now acting as a temporary connecting link between U.S. 87 North and U.S. 87 and 89 South until such time as the Fifteenth Street bridge can be constructed. After the construction of the bridge and the resulting diversion of the north-south highway traffic to Fifteenth Street, Ninth Street should adequately accommodate any local traffic in the foreseeable future. It should be retained as a north-south arterial, however, to handle the local traffic after the external traffic has been routed over Fifteenth Street.

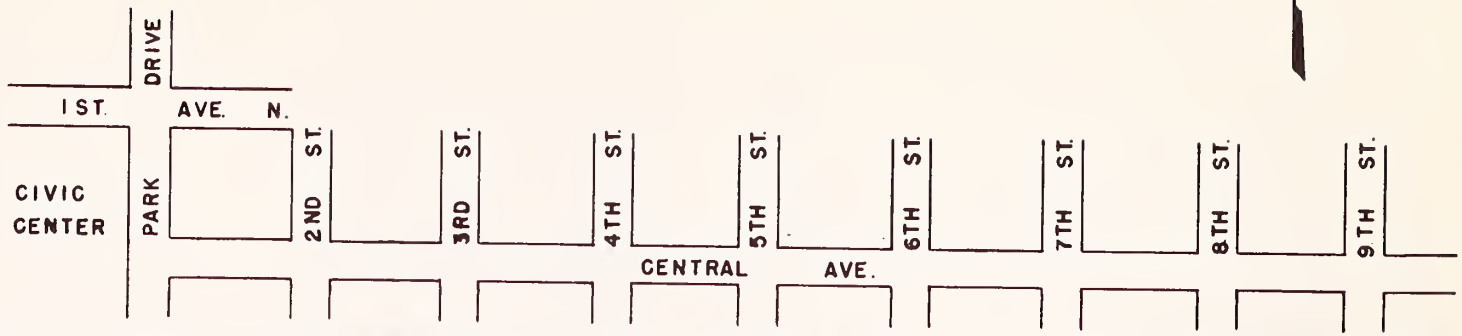
GREAT FALLS TRAFFIC SURVEY
URBAN ROUTE ANALYSIS
PARK DRIVE AND CENTRAL AVE.
FROM 1ST. AVE. N. TO 9TH ST.

LEGEND

Ⓢ = SIGNALS
PD = PROPERTY DAMAGE
IN. = INJURIES

AVERAGE SPEED

---------- WEST BOUND
———————— EAST BOUND



	1ST AVE. N.	PARK DRIVE	2ND ST.	3RD ST.	4TH ST.	5TH ST.	6TH ST.	7TH ST.	8TH ST.	9TH ST.
AREA CLASSIFICATION	INTERMEDIATE			DOWNTOWN				INTERMEDIATE		
PAVEMENT WIDTH	50'			60'						
PAVEMENT TYPE	BIT. CONC.			BIT. CONG.						
PARKING CONTROL	PARALLEL BOTH SIDES			ANGLE PARKING BOTH SIDES 1 HOUR METERS						
TRAFFIC CONTROL	Ⓢ	Ⓢ	Ⓢ	Ⓢ	Ⓢ	Ⓢ	Ⓢ	Ⓢ	Ⓢ	Ⓢ
ACCIDENTS RATE PER MILLION V.M.	83.3			126.4				73.0		
ACCIDENTS NUMBER AND TYPE	12 P.D. 2 IN.	9 P.D. 1 IN.	20 P.D.	24 P.D. 3 IN.	30 P.D.	39 P.D. 1 IN.	32 P.D. 1 IN.	17 P.D.	17 P.D. 1 IN.	
SPEED ZONES EXISTING	NOT POSTED									
SPEED ZONES PROPOSED										
OFF PEAK HOUR SPEED AND DELAY AVERAGE OVERALL SPEED M.P.H. 20										
OFF PEAK HOUR SPEED AND DELAY AVERAGE OVERALL SPEED M.P.H. 10										
OFF PEAK HOUR SPEED AND DELAY AVERAGE OVERALL SPEED M.P.H. 0										
CRITICAL APPROACH CAPACITY —— VEHICLES PER HOUR	500									
	400									
1953 DESIGN VOLUMES - - -	300									
	200									
	100									
EVALUATION	ABOVE CAPACITY			CRITICAL SECTION - HIGH ACCIDENT RATE						

PLATE 38

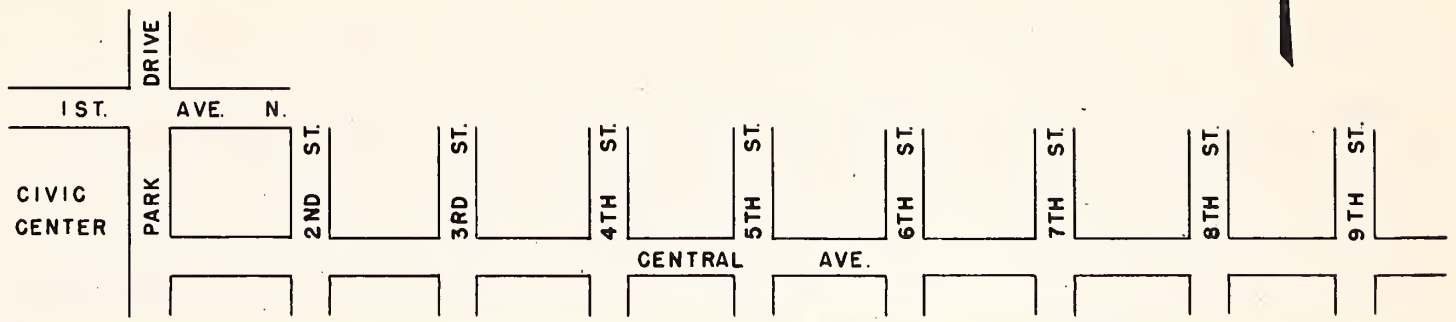
GREAT FALLS TRAFFIC SURVEY
URBAN ROUTE ANALYSIS
PARK DRIVE AND CENTRAL AVE.
FROM 1ST. AVE. N. TO 9TH ST.

LEGEND

Ⓢ = SIGNALS
PD = PROPERTY DAMAGE
IN. = INJURIES

AVERAGE SPEED

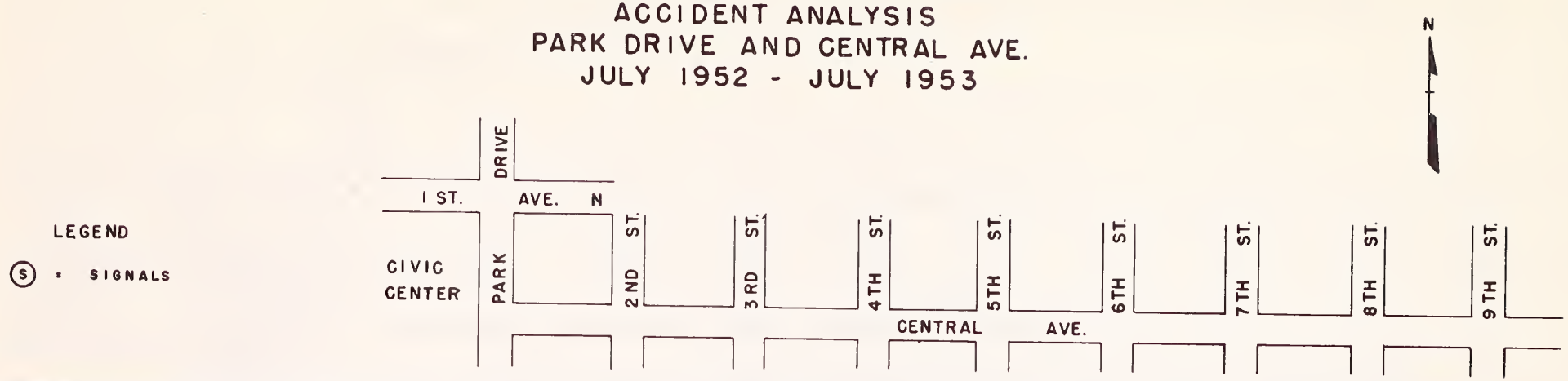
---------- WEST BOUND
———— EAST BOUND



	1ST AVE. N.	PARK DRIVE	2ND ST.	3RD ST.	4TH ST.	5TH ST.	6TH ST.	7TH ST.	8TH ST.	9TH ST.
AREA CLASSIFICATION	INTERMEDIATE		DOWNTOWN					INTERMEDIATE		
PAVEMENT WIDTH	50'		60'							
PAVEMENT TYPE	BIT. CONC.		BIT. CONC.							
PARKING CONTROL	PARALLEL BOTH SIDES		PARALLEL PARKING BOTH SIDES 1 HOUR METERS							
TRAFFIC CONTROL	Ⓢ	Ⓢ	Ⓢ	Ⓢ	Ⓢ	Ⓢ	Ⓢ	Ⓢ	Ⓢ	Ⓢ
ACCIDENTS RATE PER MILLION V.M.	83.3				126.4			73.0		
ACCIDENTS NUMBER AND TYPE	12 P.D. 2 IN.	9 P.D. 1 IN.	20 P.D.	24 P.D. 3 IN.	30 P.D.	39 P.D. 1 IN.	32 P.D. 1 IN	17 P.D.	17 P.D. 1 IN.	
SPEED ZONES EXISTING	NOT POSTED									
SPEED ZONES PROPOSED										
OFF PEAK HOUR SPEED AND DELAY — AVERAGE OVERALL SPEED M.P.H. 20										
OFF PEAK HOUR SPEED AND DELAY — 10										
OFF PEAK HOUR SPEED AND DELAY — 0										
CRITICAL APPROACH CAPACITY —— VEHICLES PER HOUR	600 / 500 / 400 / 300 / 200									
1953 DESIGN VOLUMES - - - VEHICLES PER HOUR										
EVALUATION	ADEQUATE UNTIL 1965-70 WITH PARALLEL PARKING, 4 LANES AND PROGRESSIVELY TIMED SIGNALS									

PLATE 39

GREAT FALLS TRAFFIC SURVEY
ACCIDENT ANALYSIS
PARK DRIVE AND CENTRAL AVE.
JULY 1952 - JULY 1953



INTERSECTION			1ST. AVE. N.	PARK DRIVE	2ND ST.	3RD ST.	4TH ST.	5TH ST.	6TH ST.	7TH ST.	8TH ST.	9TH ST.
PARKING CONTROLS			PARALLEL BOTH SIDES				ANGLE BOTH SIDES					
TRAFFIC CONTROLS			(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)
AVERAGE DAILY TRAFFIC 1953		10000 / 8000 / 6000 / 4000										
INTERSECTION ACCIDENTS	PROPERTY DAMAGE		3 3	2 2	3 1	2 13	8 3	3 9	6 4	6 3	7 2	
	INJURIES		1 0	0 0	0 0	0 3	0 0	0 0	0 1	0 0	0 1	
	FATALATIES		0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	
PARKING MANEUVER ACCIDENTS	PROPERTY DAMAGE		1	4	13	7	14	20	21	7	5	
	INJURIES		0	0	0	0	0	1	0	0	0	
	FATALATIES		0	0	0	0	0	0	0	0	0	
OTHER MID BLOCK ACCIDENTS	PROPERTY DAMAGE		5	1	3	2	5	7	1	1	3	
	INJURIES		1	1	0	0	0	0	0	0	0	
	FATALATIES		0	0	0	0	0	0	0	0	0	
TOTAL ACCIDENTS			14	10	20	27	30	40	33	17	18	

PLATE 40

GREAT FALLS TRAFFIC SURVEY
URBAN ROUTE ANALYSIS
PARK DRIVE AND 2ND AVE. N.
FROM 1ST AVE. N. TO 38 TH ST

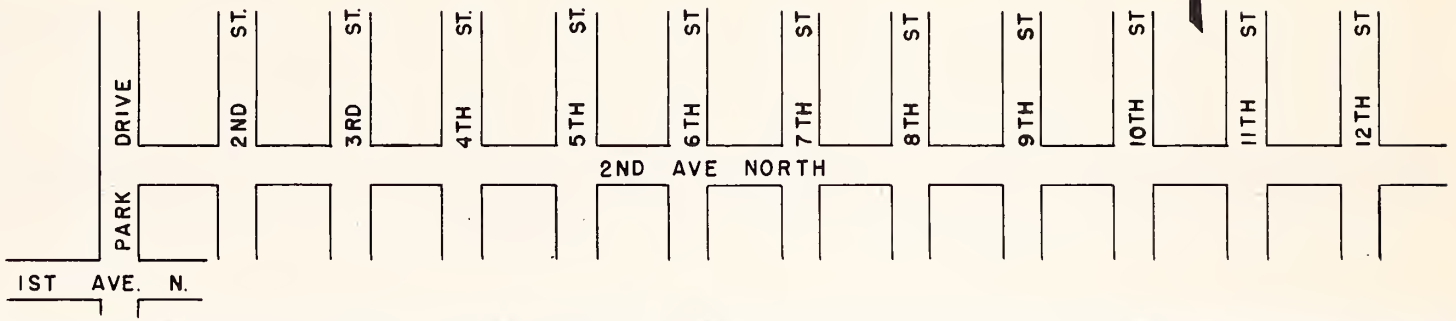
PLATE 41

LEGEND

(S) = SIGNALS
PD = PROPERTY DAMAGE
IN. = INJURIES

AVERAGE SPEED

---------- WEST BOUND
———————— EAST BOUND



INTERSECTIONS	1ST AVE. N.	PARK DRIVE	2ND ST	3RD ST	4TH ST	5TH ST	6TH ST	7TH ST	8TH ST	9TH ST	10TH ST	11TH ST	12TH ST
AREA CLASSIFICATION	INTERMEDIATE										OUTLYING		
PAVEMENT WIDTH	50'					34'							
PAVEMENT TYPE	BIT. CONC.					BITUMINOUS	CONCRETE						
PARKING CONTROL	PARALLEL BOTH SIDES		NO PARKING AT ANY TIME				NO PARKING EXCEPT SUNDAYS 9A.M. - 1P.M.				PARALLEL BOTH SIDES		
TRAFFIC CONTROL	TRUCK PROHIBITED												
	(S)				(S)		(S)			(S)			
ACCIDENTS RATE PER MILLION V.M.		34.4					38.2				17.1		
ACCIDENTS NUMBER AND TYPE	6 P.D.	2 P.D.	5 P.D.	7 P.D. 1 IN.	9 P.D.	3 FATAL 12 P.D. 2 IN.	7 P.D.	4 P.D.	7 P.D.	6 P.D.	5 P.D.	4 P.D. 1 IN.	
SPEED ZONES EXISTING			20 M.P.H.								30 M.P.H.		
SPEED ZONES PROPOSED						25 MILES PER HOUR							
OFF PEAK HOUR SPEED AND DELAY (M.P.H.: 20, 10, 0)													
CRITICAL APPROACH CAPACITY —— (VEHICLES PER HOUR: 500, 400, 300, 200, 100)													
1953 DESIGN VOLUMES ---													
EVALUATION	ADEQUATE UNTIL 1960				1965. DUE TO NO PARKING ORDINANCE						CRITICAL SECTION		

GREAT FALLS TRAFFIC SURVEY
URBAN ROUTE ANALYSIS
PARK DRIVE AND 2ND AVE. N.
FROM 1ST. AVE. N TO 38TH ST.

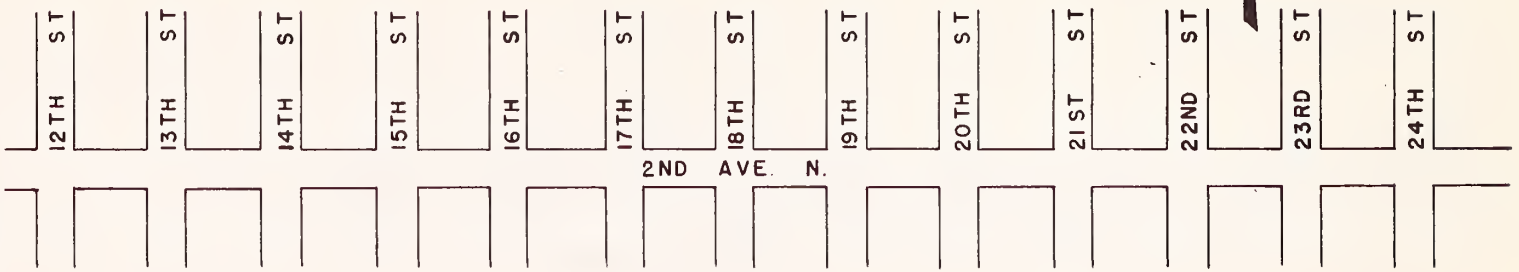
PLATE 42

LEGEND

Ⓢ = SIGNALS
PD = PROPERTY DAMAGE
IN. = INJURIES

AVERAGE SPEED

---------- WEST BOUND
———————— EAST BOUND



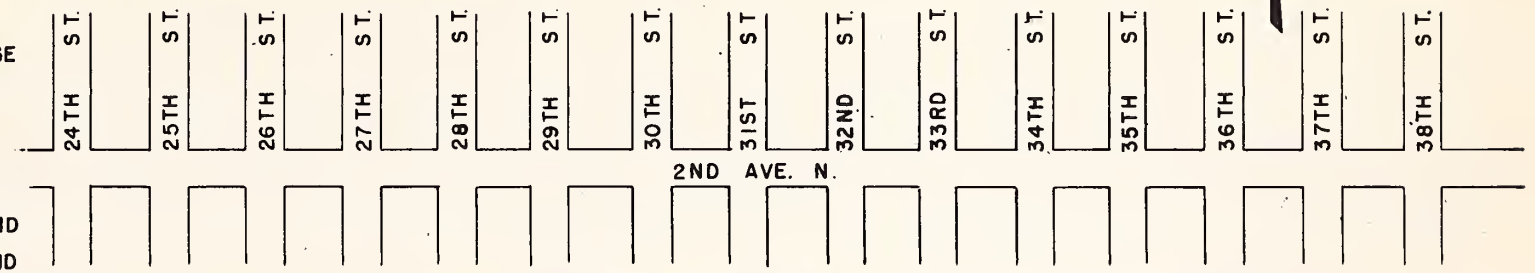
		12TH ST	13TH ST	14TH ST	15TH ST	16TH ST	17TH ST	18TH ST	19TH ST	20TH ST	21ST ST	22ND ST	23RD ST	24TH ST
INTERSECTIONS														
AREA CLASSIFICATION		OUTLYING												
PAVEMENT	WIDTH	34' BITUMINOUS CONC.												
	TYPE													
PARKING CONTROL		UNRESTRICTED PARALLEL				RESTRICTED PARALLEL				UNRESTRICTED PARALLEL				
TRAFFIC CONTROL		TRUCKS PROHIBITED; Ⓢ												
ACCIDENTS	RATE PER MILLION V.M.	17.1								16.2				
	NUMBER AND TYPE	2 P.D	1 P.D.	7 P.D.	10 P.D. 1 IN.	2 P.D.	4 P.D.	5 P.D.		5 P.D. 4 IN.			2 P.D	
SPEED ZONES	EXISTING	30 M.P.H.				15 M.P.H. HOSPITAL				30 M.P.H.				
	PROPOSED	25 M.P.H				15 M.P.H. HOSPITAL				30 M.P.H.				
OFF PEAK HOUR SPEED AND DELAY	AVERAGE OVERALL SPEED M.P.H. 20 / 10 / 0													
CRITICAL APPROACH CAPACITY —— / 1953 DESIGN VOLUMES --- VEHICLES PER HOUR	500 / 400 / 300 / 200 / 100													
EVALUATION		CRITICAL SECTION						ADEQUATE UNTIL 1960—1965						

GREAT FALLS TRAFFIC SURVEY
URBAN ROUTE ANALYSIS
PARK DRIVE AND 2ND AVE N.
FROM 1ST AVE. N. TO 38TH ST.

N

LEGEND

Ⓢ = SIGNALS
PD = PROPERTY DAMAGE
IN. = INJURIES



AVERAGE SPEED

--------- WEST BOUND
——————— EAST BOUND

			24TH ST.	25TH ST.	26TH ST.	27TH ST.	28TH ST.	29TH ST.	30TH ST.	31ST ST.	32ND ST.	33RD ST.	34TH ST.	35TH ST.	36TH ST.	37TH ST.	38TH ST.
INTERSECTIONS																	
AREA CLASSIFICATION			OUTLYING														
PAVEMENT	WIDTH		34' BITUMINOUS CONC.										21' ROAD MIX OIL				
	TYPE		13' GRAVEL SHOULDERS														
PARKING CONTROL			PARALLEL BOTH SIDES	NO PARKING 8AM-5PM.						UNRESTRICTED PARALLEL BOTH SIDES							
TRAFFIC CONTROL			TRUCKS PROHIBITED	Ⓢ							Ⓢ						
ACCIDENTS	RATE PER MILLION V.M.		16.2			14.0								17.3			
	NUMBER AND TYPE		3 P.D.	5 P.D.	2 P.O.	1 P.D.	2 P.D.	1 P.D.	1 P.D.	5 P.O.	4 P.D.	2 P.D.	1 P.O.	1 P.D.	2 P.D. 1 IN.	4 P.D. 1 IN.	
SPEED ZONES	EXISTING		30 M.P.H.	15 M.P.H. SCHOOL						30 M.P.H.							
	PROPOSED		30 M.P.H.	15 M.P.H. SCHOOL						30 M.P.H.							
OFF PEAK HOUR SPEED AND DELAY	AVERAGE OVERALL SPEED	M.P.H. 20															
		M.P.H. 10															
		M.P.H. 0															
CRITICAL APPROACH CAPACITY ——	VEHICLES PER HOUR	500															
		400															
1953 DESIGN VOLUMES ---		300															
		200															
		100															
EVALUATION			ADEQUATE UNTIL 1960-1965								SUBSTANDARD DESIGN						

PLATE 43

GREAT FALLS TRAFFIC SURVEY
URBAN ROUTE ANALYSIS
FIRST AVENUE NORTH
FROM PARK DRIVE TO 15TH ST.

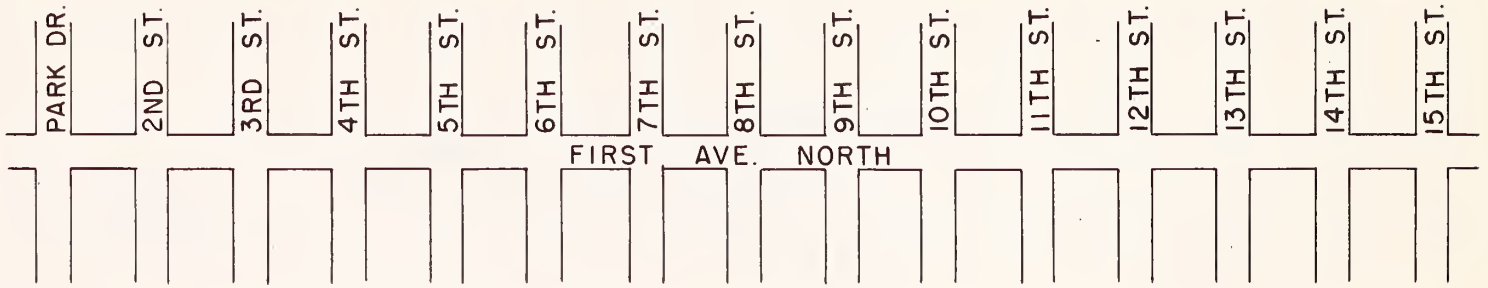
N

LEGEND

Ⓢ = SIGNALS
PD = PROPERTY DAMAGE
IN. = INJURIES

AVERAGE SPEED

--------- WEST BOUND
———— EAST BOUND



	PARK DR.	2ND ST.	3RD ST.	4TH ST.	5TH ST.	6TH ST.	7TH ST.	8TH ST.	9TH ST.	10TH ST.	11TH ST.	12TH ST.	13TH ST.	14TH ST.	15TH ST.
AREA CLASSIFICATION	INTERMEDIATE									OUTLYING					
PAVEMENT — WIDTH / TYPE	50' BIT. CONC.									34' BIT. CONC.					
PARKING CONTROL	1 HOUR METERS PARALLEL BOTH SIDES								UNRESTRICTED PARALLEL BOTH SIDES						
TRAFFIC CONTROL	Ⓢ	Ⓢ	Ⓢ	Ⓢ	Ⓢ				STOP SIGNS						STOP SIGNS
ACCIDENTS — RATE PER MILLION V.M.	80.2					37.8				64.0					
ACCIDENTS — NUMBER AND TYPE	12 P.D.	36 P.D.	21 P.D.	16 P.D.	13 P.D. 2 IN.	6 P.D. 2 IN.	5 P.D.	2 P.D.	2 P.D.	4 P.D.	5 P.D.	5 P.D. 1 IN.	6 P.D.	4 P.D. 1 IN.	
SPEED ZONES — EXISTING	NOT POSTED													SCHOOL 15 M.P.H.	
SPEED ZONES — PROPOSED	25 M.P.H.													15 M.P.H. SCHOOL	
OFF PEAK HOUR SPEED AND DELAY — AVERAGE OVERALL SPEED (M.P.H.: 20, 10, 0)															
CRITICAL APPROACH CAPACITY —— / 1953 DESIGN VOLUMES --- (VEHICLES PER HOUR: 500, 400, 300, 200, 100)															
EVALUATION	CRITICAL SECTION HIGH ACCIDENT RATE					ADEQUATE UNTIL 1960				ADEQUATE UNTIL 1970					

PLATE 44

GREAT FALLS TRAFFIC SURVEY
URBAN ROUTE ANAYLSIS
NINTH STREET
FROM 10TH AVE. S. TO 10TH AVE N.

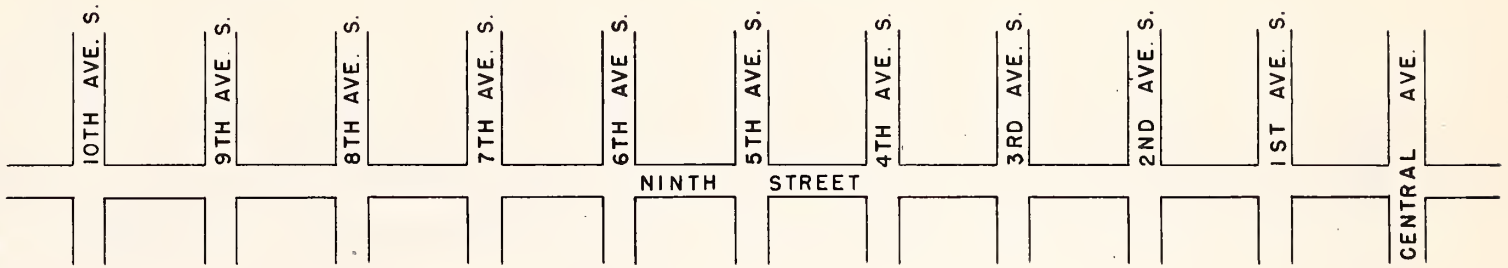
N

LEGEND

Ⓢ = SIGNALS
PD = PROPERTY DAMAGE
IN. = INJURIES

AVERAGE SPEED

--------- NORTH BOUND
———— SOUTH BOUND



		10TH AVE. S.	9TH AVE. S.	8TH AVE. S.	7TH AVE. S.	6TH AVE. S.	5TH AVE. S.	4TH AVE. S.	3RD AVE. S.	2ND AVE. S.	1 ST AVE. S.	CENTRAL AVE.
INTERSECTIONS												
AREA CLASSIFICATION		←			OUTLYING					INTERMEDIATE		→
PAVEMENT	WIDTH	← 41'		→	← 46'				→			
	TYPE	ROAD MIX OIL				MIX OIL				← 46' PORTLAND	CONG.	→
PARKING CONTROL		←				PARALLEL	BOTH SIDES					→
TRAFFIC CONTROL		Ⓢ				Ⓢ						Ⓢ
ACCIDENTS	RATE PER MILLION V.M.	←				27.0					97.4 →	
	NUMBER AND TYPE	14 P.D. 2 IN.	1 P.D.	1 P.D.	2 P.D.	3 P.D.	3 P.D.	2 P.D.	3 P.D.	4 P.D.	17 PD. 1 IN.	
SPEED ZONES	EXISTING	←	25 M.P.H.	→	SCHOOL 15 M.P.H.	←		25 M.P.H.	→		SCHOOL 15 M.P.H.	
	PROPOSED	←	25 M.P.H.	→	15 M.P.H.	←		25 M.P.H.	→		15 M.P.H.	→
OFF PEAK HOUR SPEED AND DELAY	AVERAGE SPEED (M.P.H.) 20											
	OVERALL SPEED (M.P.H.) 10											
	(M.P.H.) 0											
CRITICAL APPROACH CAPACITY —— / 1953 DESIGN VOLUMES --- (VEHICLES PER HOUR)	1000											
	800											
	600											
	400											
	200											
EVALUATION		←		ADEQUATE	UNTIL 1970						CRITICAL SECTION	

PLATE 45

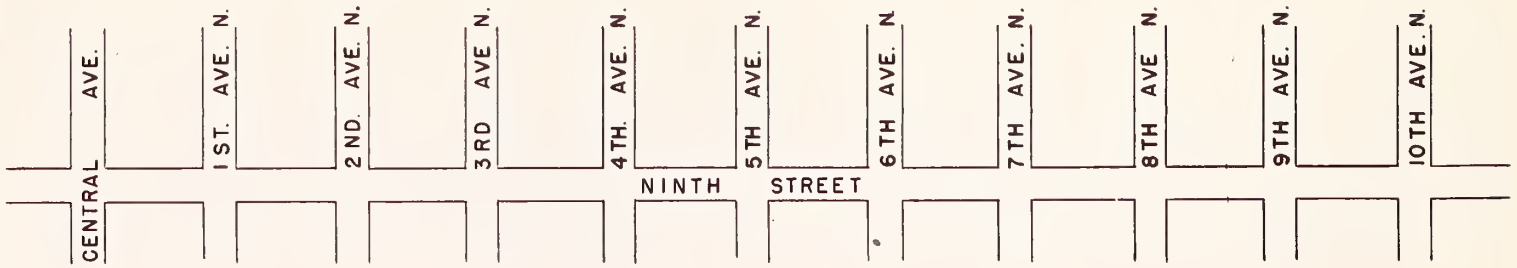
GREAT FALLS TRAFFIC SURVEY
URBAN ROUTE ANAYLSIS
NINTH STREET
FROM 10TH AVE. S. TO 10TH AVE. N.

LEGEND

Ⓢ = SIGNALS
PD = PROPERTY DAMAGE
IN. = INJURIES

AVERAGE SPEED

---------- NORTH BOUND
———————— SOUTH BOUND

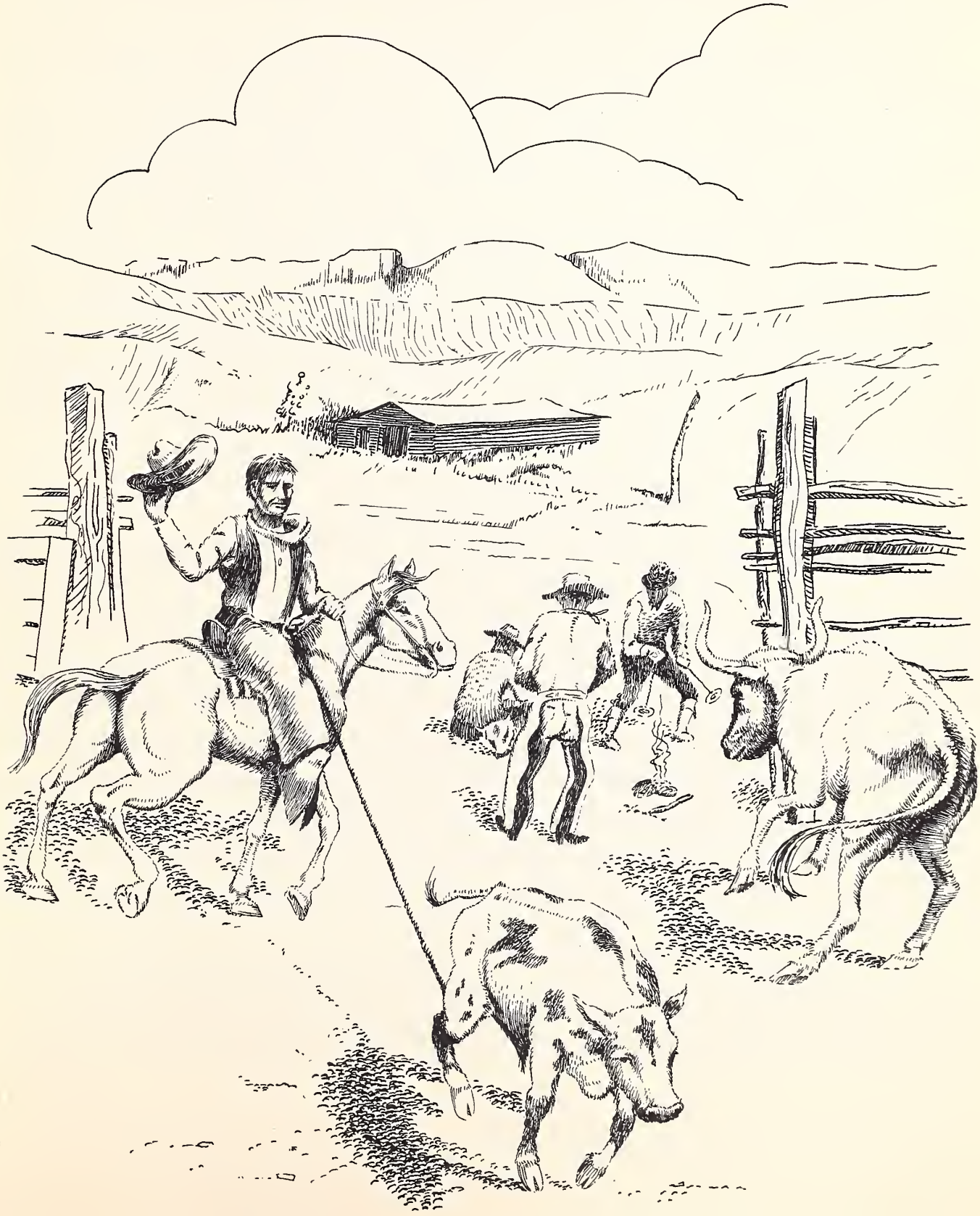


		CENTRAL AVE.	1ST. AVE. N.	2ND. AVE. N.	3RD. AVE. N.	4TH. AVE. N.	5TH. AVE. N.	6TH AVE. N.	7TH AVE. N.	8TH AVE. N.	9TH AVE. N.	10TH AVE. N.
INTERSECTIONS												
AREA CLASSIFICATION		← INTERMEDIATE →				OUTLYING →						
PAVEMENT	WIDTH	← 46' ROAD →										
	TYPE	← MIX OIL →										
PARKING CONTROL		← PARALLEL BOTH SIDES →										
TRAFFIC CONTROL		Ⓢ		Ⓢ								
ACCIDENTS	RATE PER MILLION V.M.	← 97.4 →						← 18.0 →				
	NUMBER AND TYPE	19 P.D.	15 P.D.	15 P.D. 1 IN.	6 P.D.	2 P.D.	2 P.D.	1 P.D.	3 P.D.		1 P.D.	
SPEED ZONES	EXISTING	← 25 M.P.H. →										
	PROPOSED	← 25 M.P.H. →										
OFF PEAK HOUR SPEED AND DELAY	AVERAGE OVERALL SPEED M.P.H. 20											
	10											
	0											
CRITICAL APPROACH CAPACITY —— VEHICLES PER HOUR	1000											
	800											
1953 DESIGN VOLUMES – – –	600											
	400											
	200											
EVALUATION		← CRITICAL SECTION HIGH ACCIDENT RATE →				SHOULD FUNCTION ADEQUATELY UNTIL 1970 →						

PLATE 46

Part Six

Speed and Delay Studies



SPEED & DELAY STUDIES

During the period from July 5 to July 9, 1953, a series of speed and delay studies were made on four of the major arterials in Great Falls. The object of these studies was to determine the amount, cause, location, and frequency of traffic delays, as well as the average over-all speeds during both peak and off-peak hours. Peak hour observations were made between 4:30 and 5:30 P.M., and off-peak between 10 and 11 A.M.

The field observations were taken by using a car to float with the traffic for at least five runs in each direction on each route. All delays that reduced speeds to under five miles per hour were timed, classified, and recorded. The time in seconds required to travel each block was also noted so that average speeds could be computed.

The following charts analyze and portray these data. They include such comparisons as the actual time spent in traveling in each direction, amount and kind of delays encountered, and average speeds for both peak and off-peak hours. By studying the charts for each route, the relative amount of congestion becomes apparent as measured by average speeds and number and length of delays. A further analysis of the characteristics of delays on each route is also shown so that clues to any remedial action may become evident.

CENTRAL AVENUE

Plates 49, 50, and 51 present an analysis of typical driving conditions found on Central Avenue during both the peak and off-peak hours. It will be noted that during the peak hour average over-all speeds were down to between seven and eight miles per hour, and actual running time averaged only 60% of the total time required to travel from Park Drive to Ninth Street. The remaining 40% of the time spent enroute can be charged to stopping delays principally occurring at intersections.

The proposed change from angle to parallel parking will enable four-lane traffic to be established and should eliminate much of the delay on Central Avenue which is now caused by parking maneuvers and turning movements. The greater portion of the intersectional delays are caused by waiting for signal changes, and this can only be eliminated by adjusting the signal timing.

Two time-space diagrams for progressive signal timing are shown on Plates 47 and 48. Plate 47 details the single alternate system with a 45-second cycle which is essentially the system in effect at the present time. Revisions have been made,

however, in the cycle split according to traffic volumes and in reducing the amber time from five to three seconds. It will be noted that even with these revisions the optimum speed from park Drive to Ninth Street is only 13 miles per hour on a through band of 22 seconds, which is considered too slow for normal arterial traffic. Plate 48 depicts the double alternate system with the signal cycle length increased from 45 to 55 seconds. This system has the advantage of speeding up the traffic to 21 miles per hour on a 15-second green band and allowing more vehicles to clear the intersection due to the longer green period for each signal cycle.

The 55-second cycle, double alternate system, should operate more efficiently with four-lane traffic, but both systems should be given a field test to determine which fits local conditions more closely. Some minor adjustments will probably be necessary on either system to compensate for any special conditions.

FIRST AVENUE NORTH

Plates 52, 53, and 54 graphically illustrate the results of the speed and delay studies which were made on First Avenue North between Park Drive and Fifteenth Street. The signalized intersections and the stop signs at Ninth Street account for 86% of the total delays encountered.

Due to the general congestion and relatively high traffic volumes, it has been recommended that this avenue be placed in one-way operation carrying eastbound traffic from Park Drive to either Thirteenth or Fifteenth Streets. After this has been done, the existing signals should be retimed so that traffic will be able to progress at speeds of 20 to 25 miles per hour.

Operation of First Avenue North as a one-way arterial will increase the traffic volumes at Ninth Street to a point where it will be necessary to signalize this intersection. Any signals that are installed at this location should be synchronized with the present signals so that progressive eastward movement may be maintained.

The recommended diagonal through Morony Park will permit the transition from one-way to two-way traffic without the aid of traffic signals. If this plan is not carried out, the one-way couplet will have to be extended to Fifteenth Street, and it will probably be necessary to signalize this intersection as a control measure.

SECOND AVENUE NORTH

Traffic on Second Avenue North is now operating at speeds approximating 20 miles per hour with very few serious delays even during the peak hour. This can be attri-

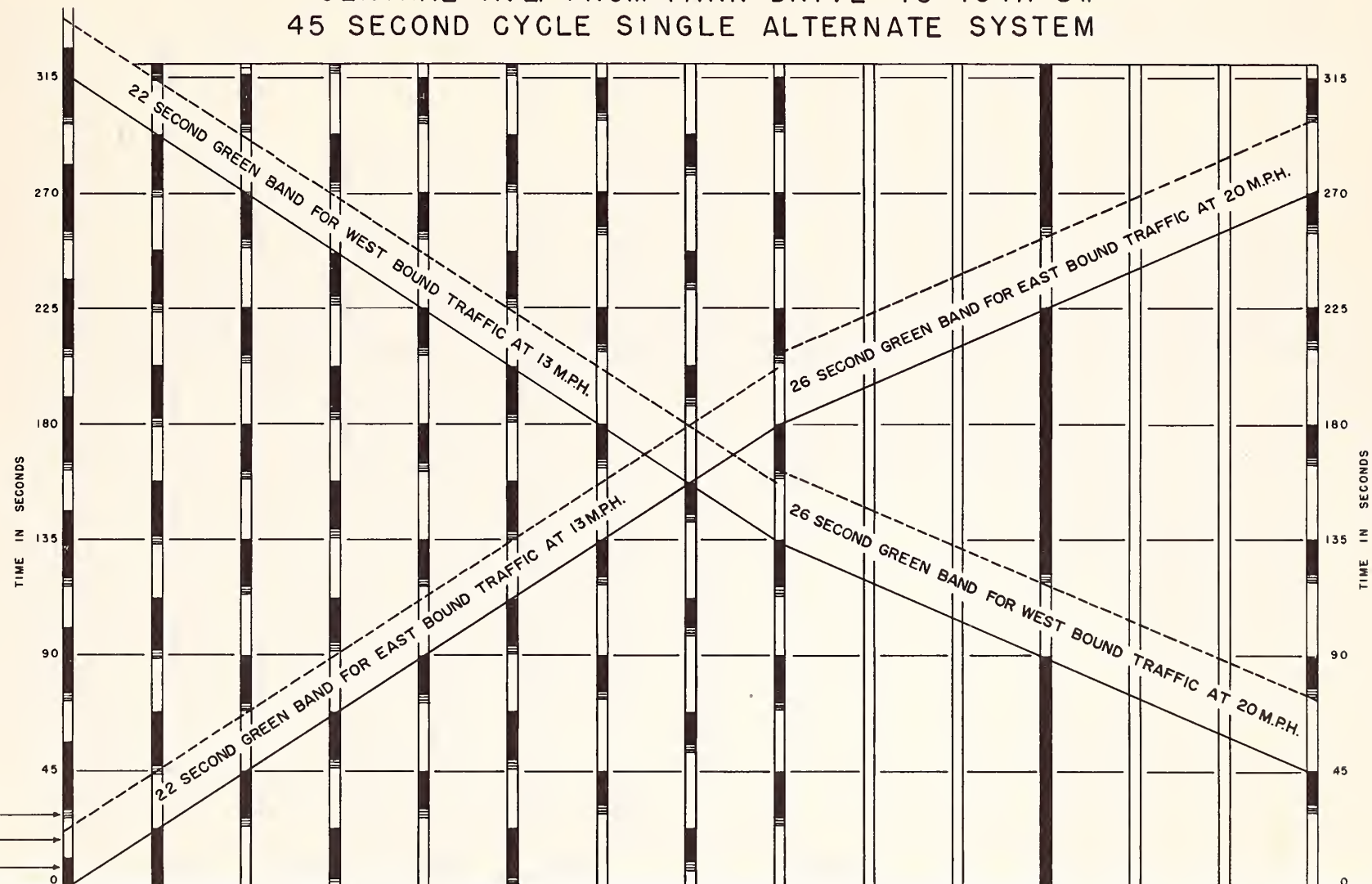
buted to the prohibiting of parking where traffic volumes are heaviest from Park Drive to Ninth Street with the resulting decrease in general congestion.

If the recommendations of this report are put into effect, this avenue will become a one-way street for westbound traffic between Fifteenth Street and Park Drive. Progressive signal timing will then be relatively simple to establish, which should allow one-way traffic to maintain speeds of 20 to 25 miles per hour.

NINTH STREET

Plate 60 presents speed and delay data on Ninth Street which, at the present time, is carrying the traffic entering the city on U.S. 87 and 89. It is planned to reroute this highway traffic over Fifteenth Street after a new bridge is constructed. Until such time as this can be done, an adjustment of the cycle split at Central Avenue is indicated by the 31-second delay at this intersection during the peak hour. The present 45-second cycle allocates 15 seconds of green time to Ninth Street and 25 seconds to Central Avenue. Traffic volumes indicate that this split should be approximately 45% green on Ninth Street and 55% on Central Avenue. A change to a 55-second cycle with a 45% split will increase the green time on Ninth Street to 24 seconds, which should allow ample time for all vehicles to clear the intersection.

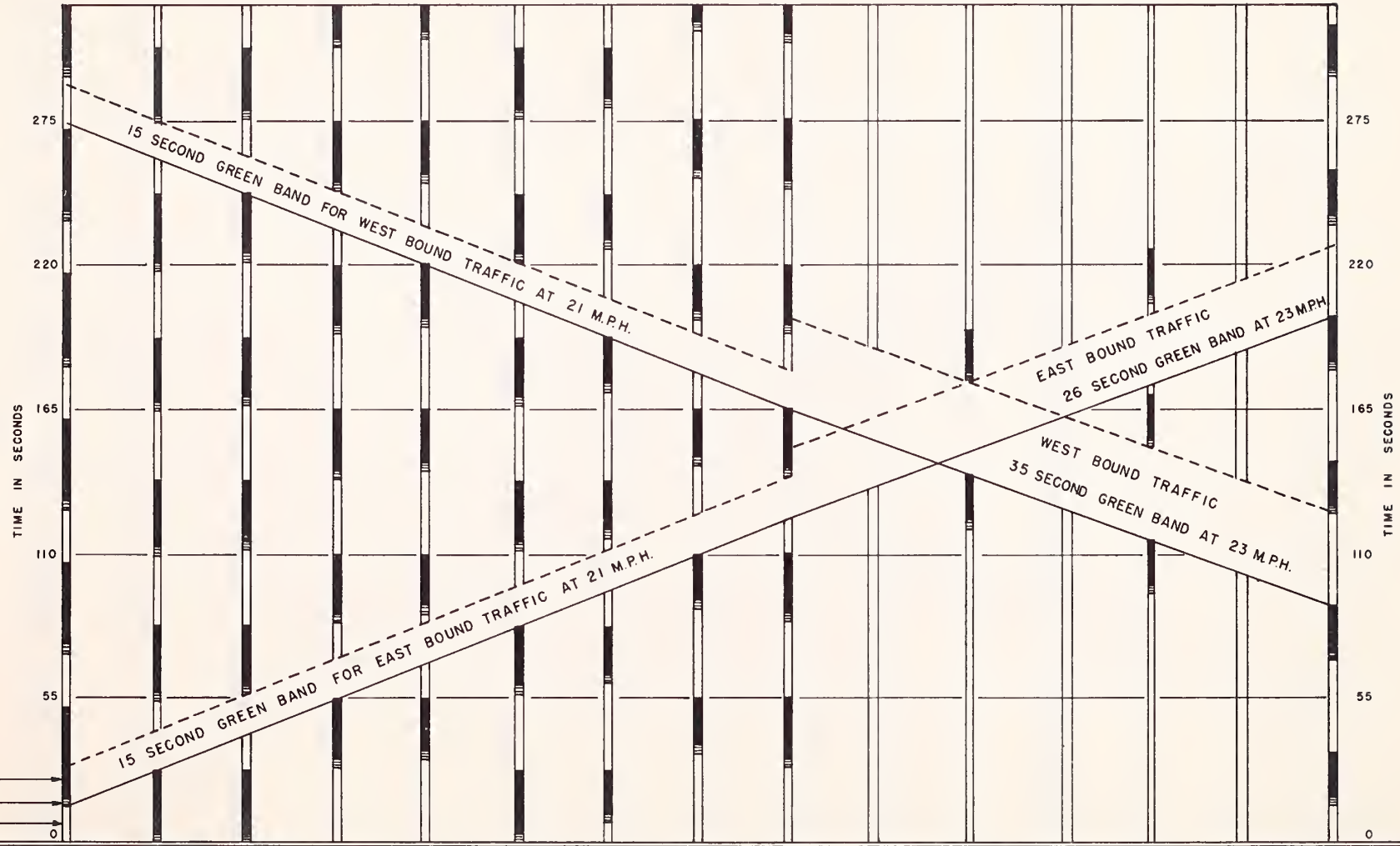
GREAT FALLS TRAFFIC SURVEY
PROPOSED SIGNAL TIMING
CENTRAL AVE. FROM PARK DRIVE TO 15TH ST.
45 SECOND CYCLE SINGLE ALTERNATE SYSTEM



CROSS STREET	PARK DRIVE	SECONO ST.	THIRO ST.	FOURTH ST.	FIFTH ST.	SIXTH ST.	SEVENTH ST.	EIGHTH ST.	NINTH ST.	TENTH ST.	ELEVENTH ST.	TWELFTH ST.	13 TH. ST.	14 TH. ST.	15 TH. ST.	CROSS STREET
TRAFFIC CONTRDL	SIGNAL	SIGNAL	SIGNAL	SIGNAL	SIGNAL	SIGNAL	SIGNAL	SIGNAL	SIGNAL	—	—	FUTURE SIGNAL	—	—	SIGNAL	TRAFFIC CONTROL
ACCUM. DISTANCE	0'	430'	860'	1290'	1720'	2150'	2580'	3010'	3440'	3870'	4300'	4730'	5160'	5590'	6020'	ACCUM DISTANCE
CYCLE SPLIT	35-65	50-50	55-45	55-45	55-45	55-45	55-45	55-45	55-45	—	—		—	—	60-40	CYCLE SPLIT
CENTRAL GREEN	15 SECONDS	22 SECONDS	24 SECONDS	24 SECONDS	24 SECONDS	24 SECONDS	24 SECONDS	24 SECONOS	24 SECONDS	—	—	26 SECONDS	—	—	26 SECONDS	CENTRAL GREEN
CENTRAL YELLOW	3 "	3 "	3 "	3 "	3 "	3 "	3 "	3 "	3 "	—	—	3 "	—	—	3 "	CENTRAL YELLOW
CENTRAL RED	27 "	20 "	18 "	18 "	18 "	18 "	18 "	18 "	18 "	—	—	16 "	—	—	16 "	CENTRAL RED
CYCLE LENGTH	45 SECONDS	45 SECONDS	45 SECONDS	45 SECONDS	45 SECONDS	45 SECONDS	45 SECONDS	45 SECONOS	45 SECONDS	—	—	45 SECONDS	—	—	45 SECONDS	CYCLE LENGTH
GREEN OFFSET	11 SECONDS	22 SECONDS	0 SECONDS	22 SECONDS	0 SECONDS	22 SECONDS	0 SECONOS	22 SECONDS	0 SECONDS	—	—	0 SECONDS	—	—	0 SECONDS	GREEN OFFSET

PLATE 47

GREAT FALLS TRAFFIC SURVEY
PROPOSED SIGNAL TIMING
CENTRAL AVE. FROM PARK DRIVE TO 15TH ST.
55 SECOND CYCLE DOUBLE ALTERNATE SYSTEM

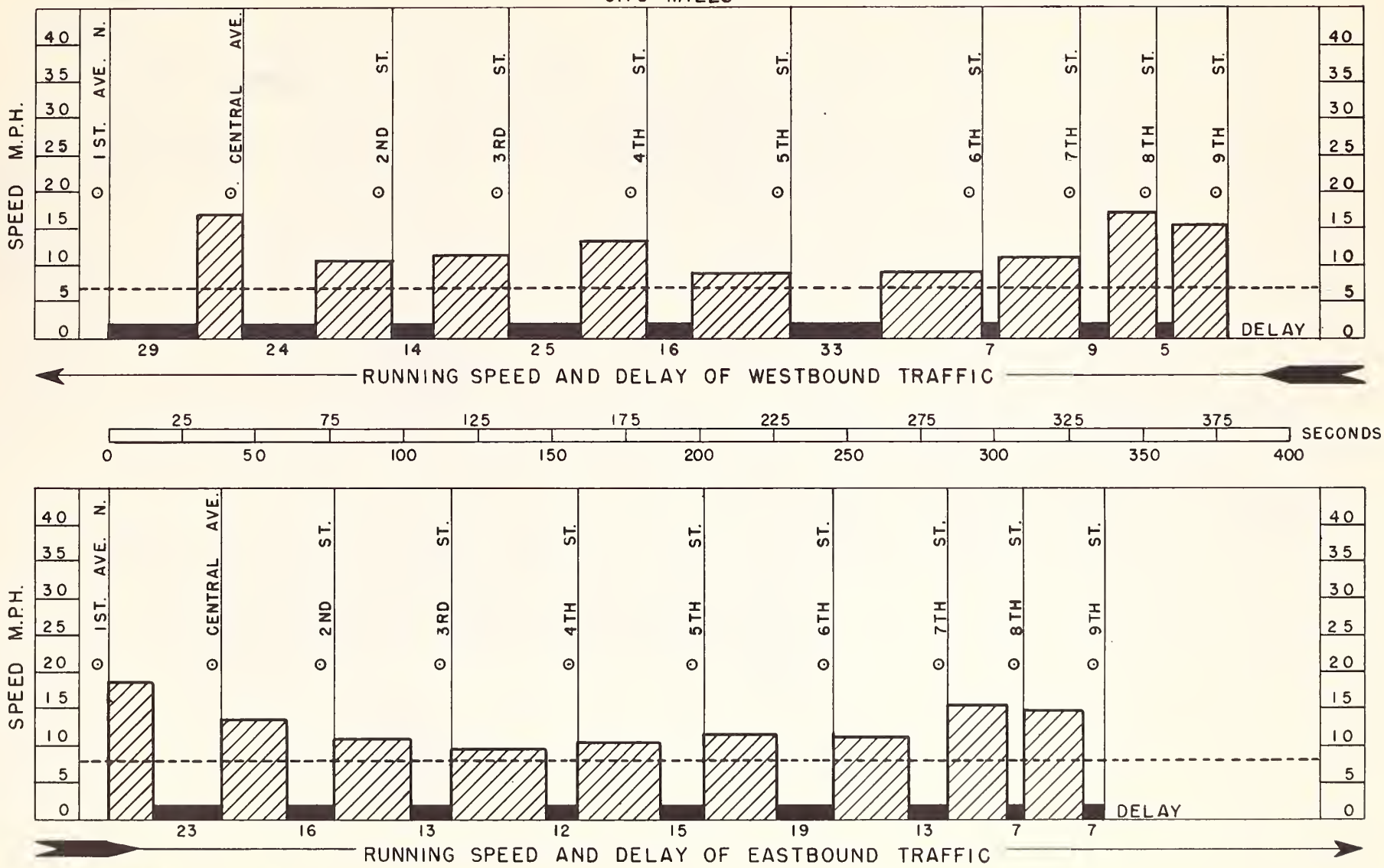


CROSS STREET	PARK DRIVE	2ND ST.	3RD ST.	4TH ST.	5TH ST.	6TH ST.	7TH ST.	8TH ST.	9TH ST.	10TH ST	11TH ST.	12TH ST	13TH ST.	14TH ST.	15TH ST.	CROSS STREET
TRAFFIC CONTROL	SIGNAL	SIGNAL	SIGNAL	SIGNAL	SIGNAL	SIGNAL	SIGNAL	SIGNAL	SIGNAL		FUTURE SIGNAL		FUTURE SIGNAL		SIGNAL	TRAFFIC CONTROL
ACCUM. DISTANCE	0'	430'	860'	1290'	1720'	2150'	2580'	3010'	3440'	3870'	4300'	4730	5160'	5590'	6020'	ACCUM. DISTANCE
CYCLE SPLIT	35-65	50-50	55-45	55-45	60-40	55-45	65-35	65-35	55-45		60-40		60-40		60-40	CYCLE SPLIT
CENTRAL GREEN	19 SECONDS	27 SECONDS	30 SECONDS	30 SECONDS	33 SECONDS	30 SECONDS	35 SECONDS	35 SECONDS	28 SECONDS		33 SECONDS		33 SECONDS		33 SECONDS	CENTRAL GREEN
CENTRAL YELLOW	3 "	3 "	3 "	3 "	3 "	3 "	3 "	3 "	3 "		3 "		3 "		3 "	CENTRAL YELLOW
CENTRAL RED	33 "	25 "	22 "	22 "	19 "	22 "	17 "	17 "	24 "		19 "		19 "		19 "	CENTRAL RED
CYCLE LENGTH	55 SECONDS	55 SECONDS	55 SECONDS	55 SECONDS	55 SECONDS	55 SECONDS	55 SECONDS	55 SECONDS	55 SECONDS		55 SECONDS		55 SECONDS		55 SECONDS	CYCLE LENGTH
GREEN OFFSET	52 SECONDS	28 SECONDS	25 SECONDS	0 SECONDS	0 SECONDS	25 SECONDS	28 SECONDS	0 SECONDS	0 SECONDS		30 SECONDS		5 SECONDS		35 SECONDS	GREEN OFFSET

PLATE 48

GREAT FALLS TRAFFIC SURVEY
PEAK HOUR - SPEED AND DELAY
PARK DRIVE AND CENTRAL AVE. FROM 1ST AVE. N. TO 9TH ST.

0.73 MILES



AVERAGE RUNNING SPEED

AVERAGE OVERALL SPEED

AVERAGE STOPPING DELAY

2 SECONDS

⊙ SIGNALS

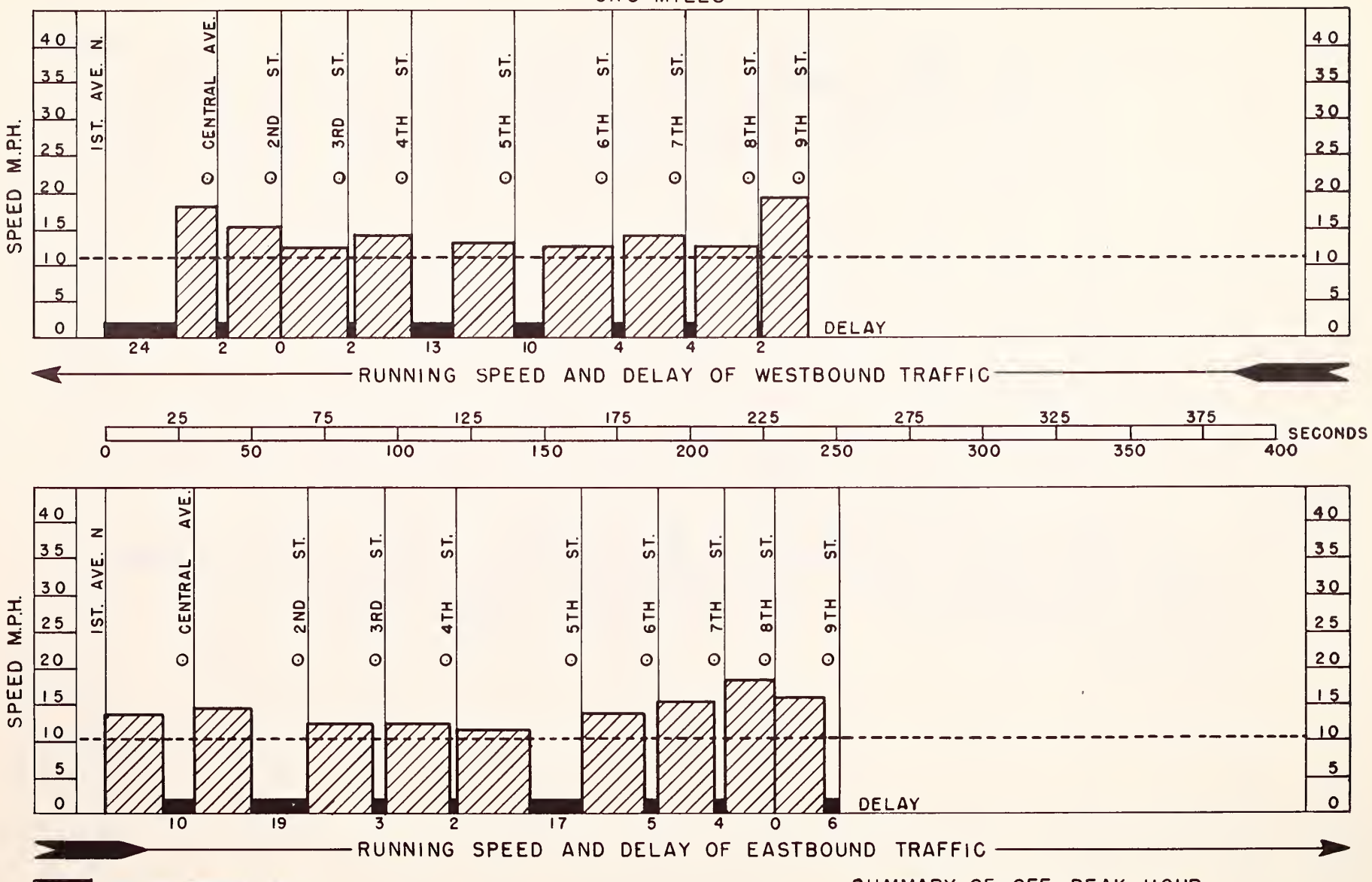
SUMMARY OF PEAK HOUR

	WESTBOUND	EASTBOUND
TOTAL RUNNING TIME	3 MIN. 37 SEC.	3 MIN. 32 SEC.
TOTAL STANDING DELAY	2 MIN. 42 SEC.	2 MIN. 5 SEC.
AVERAGE OVERALL SPEED	6.9 M.P.H.	7.8 M.P.H.

PLATE 49

GREAT FALLS TRAFFIC SURVEY
OFF-PEAK HOUR - SPEED AND DELAY
PARK DRIVE AND CENTRAL AVE. FROM 1ST. AVE. N. TO 9TH ST.

0.73 MILES



AVERAGE RUNNING SPEED

AVERAGE OVERALL SPEED

AVERAGE STOPPING DELAY

2 SECONDS

⊙ SIGNALS

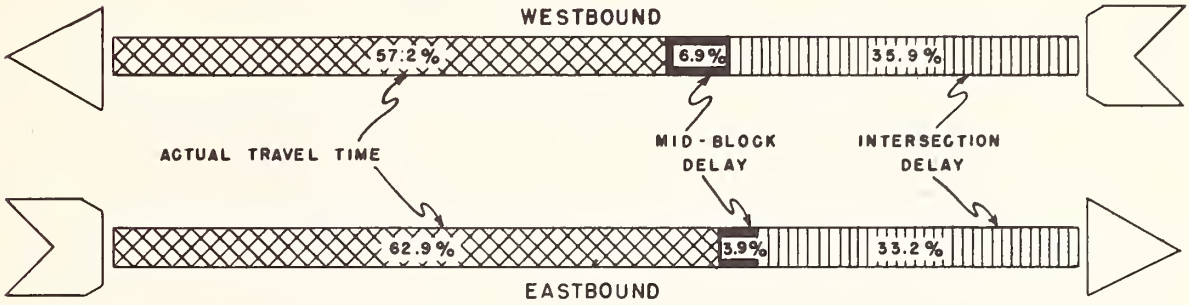
SUMMARY OF OFF-PEAK HOUR

	WESTBOUND	EASTBOUND
TOTAL RUNNING TIME	3 MIN. 0 SEC.	3 MIN. 6 SEC.
TOTAL STANDING DELAY	1 MIN. 1 SEC.	1 MIN. 6 SEC.
AVERAGE OVERALL SPEED	10.9 M.P.H.	10.4 M.P.H.

PLATE 50

GREAT FALLS TRAFFIC SURVEY
PEAK HOUR - SPEED AND DELAY
PARK DRIVE AND CENTRAL AVE - FROM 1ST AVE. N. TO 9TH ST.

PER CENT TRAVEL TIME



	OFF-PEAK HOUR		PEAK HOUR	
	WESTBOUND	EASTBOUND	WESTBOUND	EASTBOUND
AVERAGE OVERALL DRIVING TIME	4 MIN. 1 SEC.	4 MIN. 12 SEC.	6 MIN. 19 SEC.	5 MIN. 37 SEC.
AVERAGE OVERALL SPEED	10.9 M.P.H.	10.4 M.P.H.	6.9 M.P.H.	7.8 M.P.H.
AVERAGE TRAVELING SPEED	14.5 M.P.H.	14.1 M.P.H.	12.1 M.P.H.	12.4 M.P.H.

PER CENT DELAY

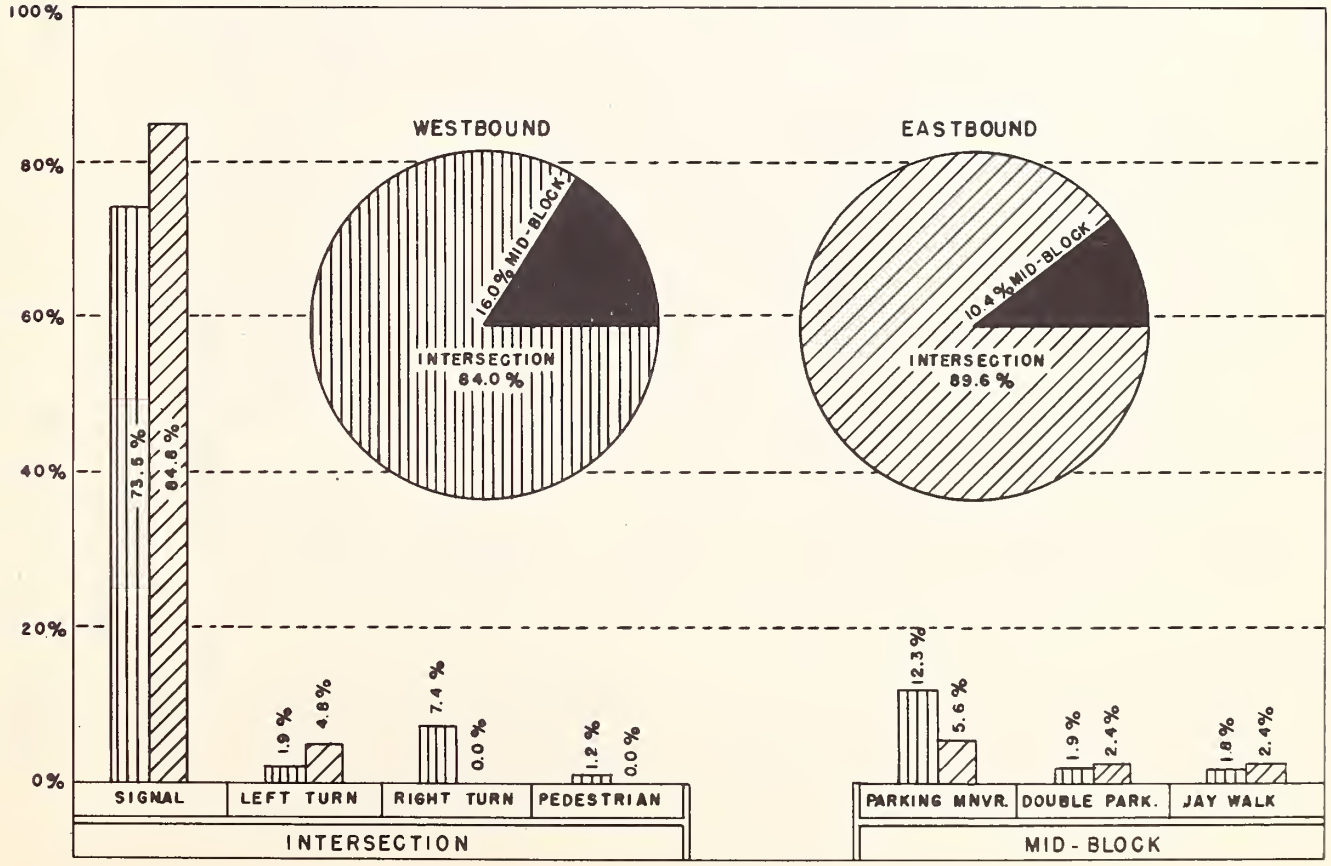
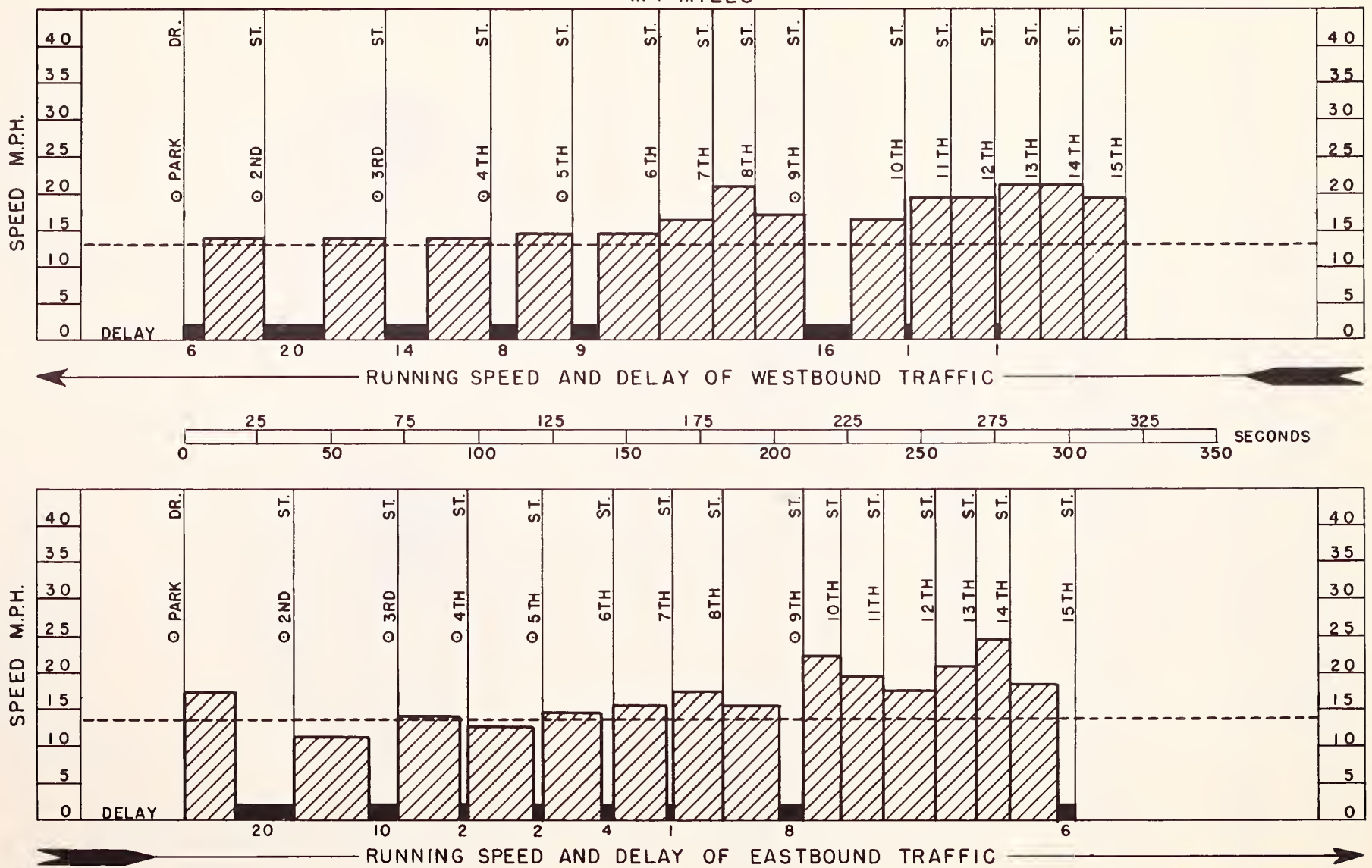


PLATE 51

GREAT FALLS TRAFFIC SURVEY
PEAK HOUR - SPEED AND DELAY
FIRST AVE. NORTH FROM PARK DRIVE TO 15TH. ST.

1.14 MILES



AVERAGE RUNNING SPEED

AVERAGE OVERALL SPEED

AVERAGE STOPPING DELAY

2 SECONDS

⊙ SIGNALS

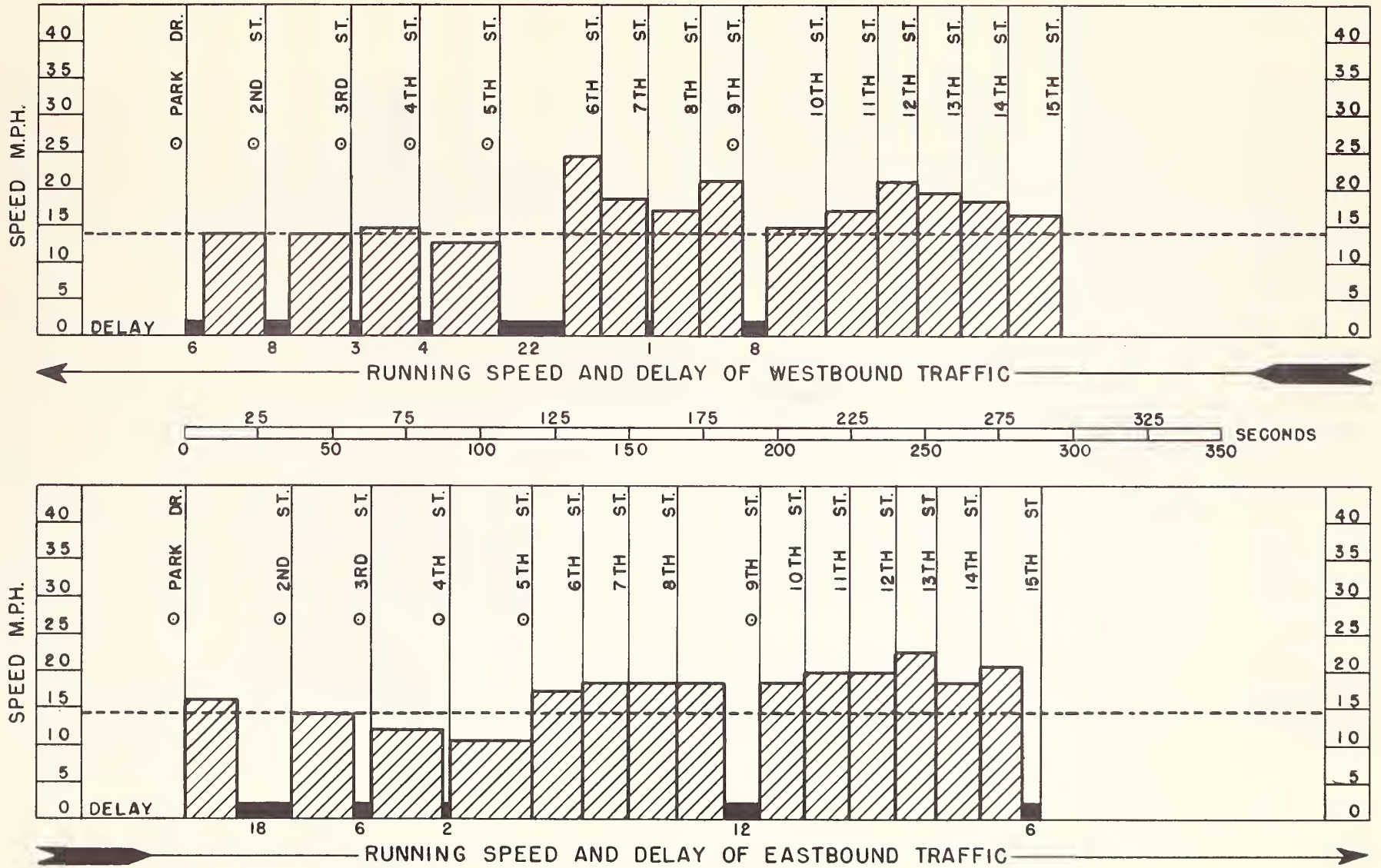
SUMMARY OF PEAK HOUR

	WESTBOUND	EASTBOUND
TOTAL RUNNING TIME	4 MIN. 4 SEC.	4 MIN. 9 SEC.
TOTAL STANDING DELAY	1 MIN. 15 SEC.	53 SEC.
AVERAGE OVERALL SPEED	12.9 M.P.H.	13.6 M.P.H.

PLATE 52

GREAT FALLS TRAFFIC SURVEY
OFF-PEAK HOUR - SPEED AND DELAY
FIRST AVE. NORTH FROM PARK DRIVE TO 15TH ST.

1.14 MILES



AVERAGE RUNNING SPEED

AVERAGE OVERALL SPEED

AVERAGE STOPPING DELAY

2 SECONDS

SIGNALS

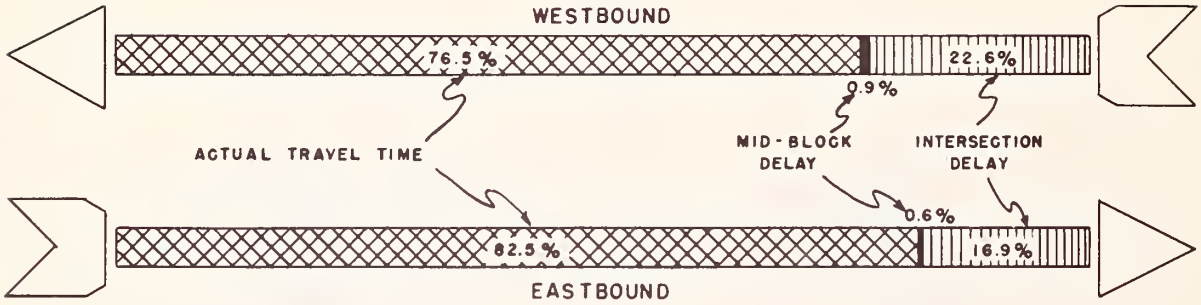
SUMMARY OF OFF-PEAK HOUR

	WESTBOUND	EASTBOUND
TOTAL RUNNING TIME	4 MIN. 4 SEC.	4 MIN. 5 SEC.
TOTAL STANDING DELAY	52 SEC.	44 SEC.
AVERAGE OVERALL SPEED	13.9 M.P.H.	14.2 M.P.H.

PLATE 53

GREAT FALLS TRAFFIC SURVEY
PEAK HOUR - SPEED AND DELAY
1ST AVE. N. FROM PARK DRIVE TO 15TH ST.

PER CENT TRAVEL TIME



	OFF-PEAK HOUR		PEAK HOUR	
	WESTBOUND	EASTBOUND	WESTBOUND	EASTBOUND
AVERAGE OVERALL DRIVING TIME	4 MIN. 56 SEC.	4 MIN. 49 SEC.	5 MIN. 19 SEC.	5 MIN. 2 SEC.
AVERAGE OVERALL SPEED	13.9 M.P.H.	14.2 M.P.H.	12.9 M.P.H.	13.6 M.P.H.
AVERAGE TRAVELING SPEED	16.8 M.P.H.	16.7 M.P.H.	16.8 M.P.H.	16.5 M.P.H.

PER CENT DELAY

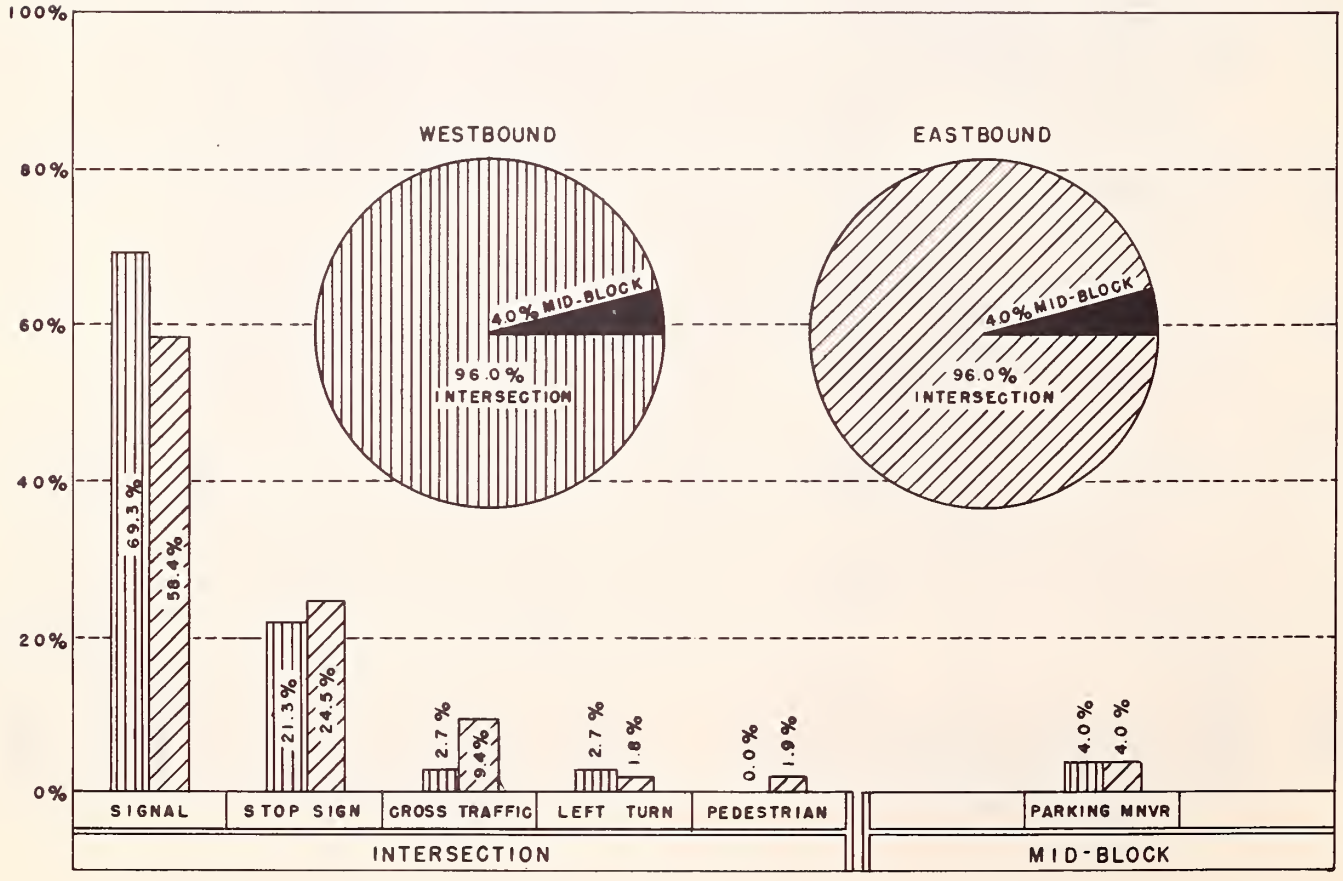
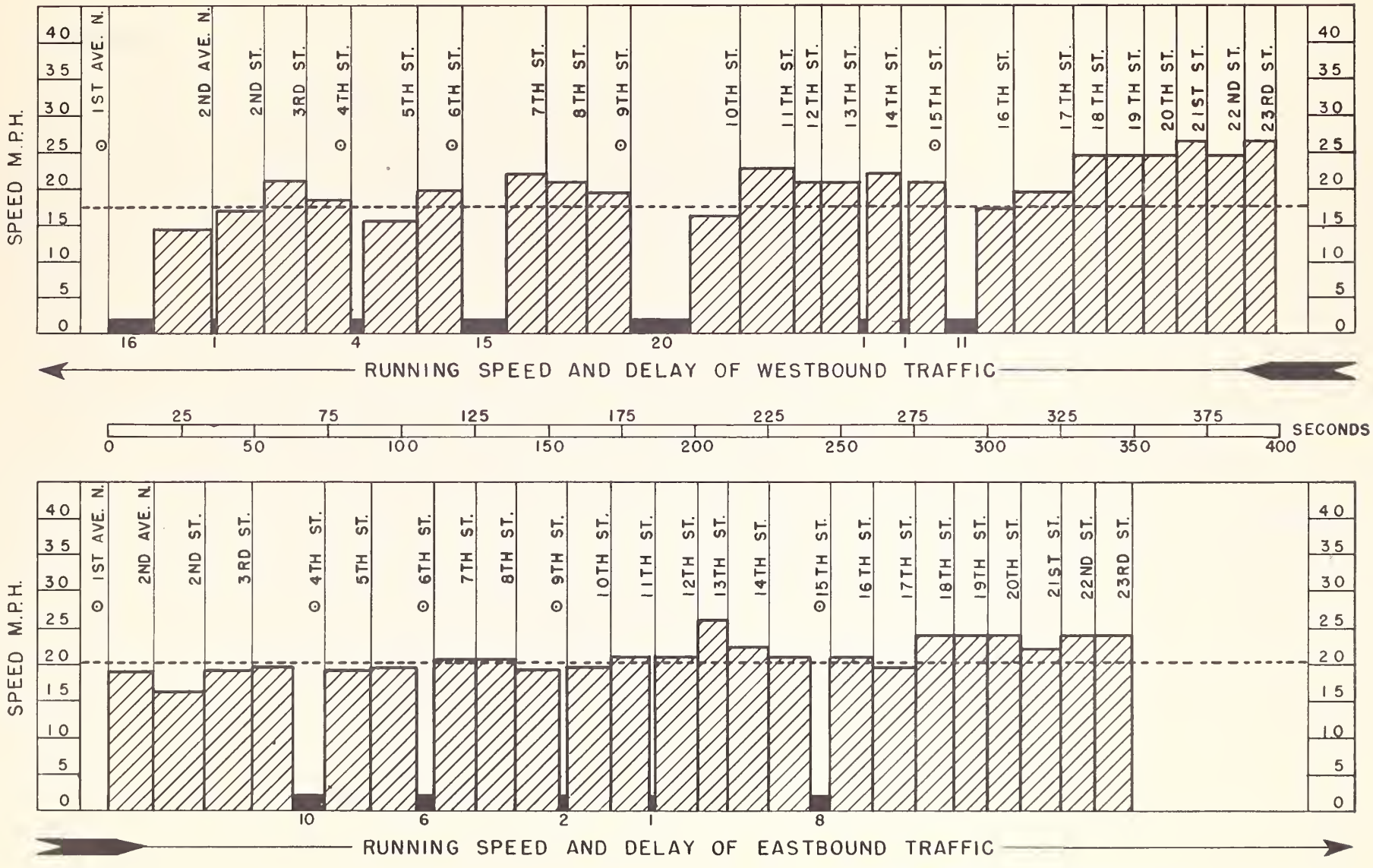


PLATE 54

GREAT FALLS TRAFFIC SURVEY
PEAK HOUR - SPEED AND DELAY
PARK DRIVE AND 2ND AVE. N. FROM 1ST AVE. N. TO 38TH ST.

3.09 MILES



AVERAGE RUNNING SPEED

AVERAGE OVERALL SPEED

AVERAGE STOPPING DELAY

2 SECONDS

⊙ SIGNALS

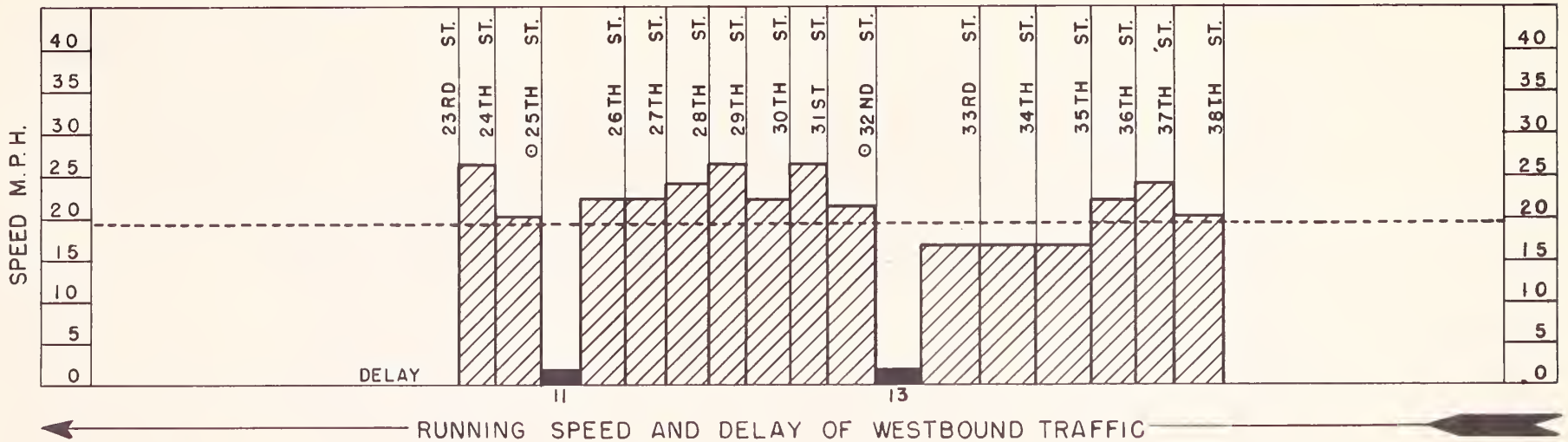
SUMMARY OF PEAK HOUR

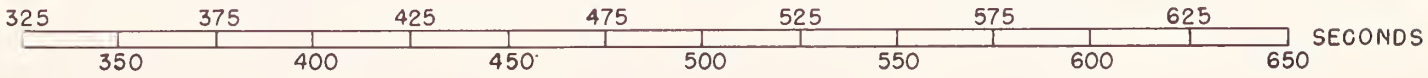
	WESTBOUND	EASTBOUND
TOTAL RUNNING TIME	8 MIN. 53 SEC.	8 MIN. 32 SEC.
TOTAL STANDING DELAY	1 MIN. 33 SEC.	37 SEC.
AVERAGE OVERALL SPEED	17.8 M.P.H.	20.3 M.P.H.

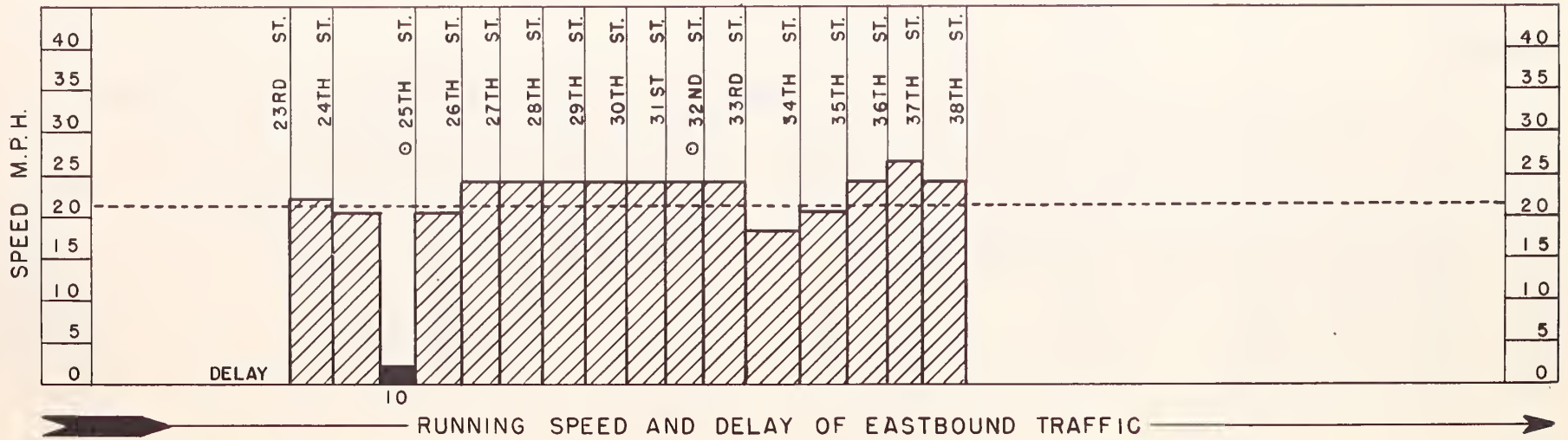
PLATE 55

GREAT FALLS TRAFFIC SURVEY
PEAK HOUR - SPEED AND DELAY
PARK DRIVE AND 2ND AVE. N. FROM 1ST AVE. N, TO 38TH ST.

3.09 MILES







AVERAGE RUNNING SPEED

AVERAGE OVERALL SPEED

AVERAGE STOPPING DELAY

2 SECONDS

⊙ SIGNALS

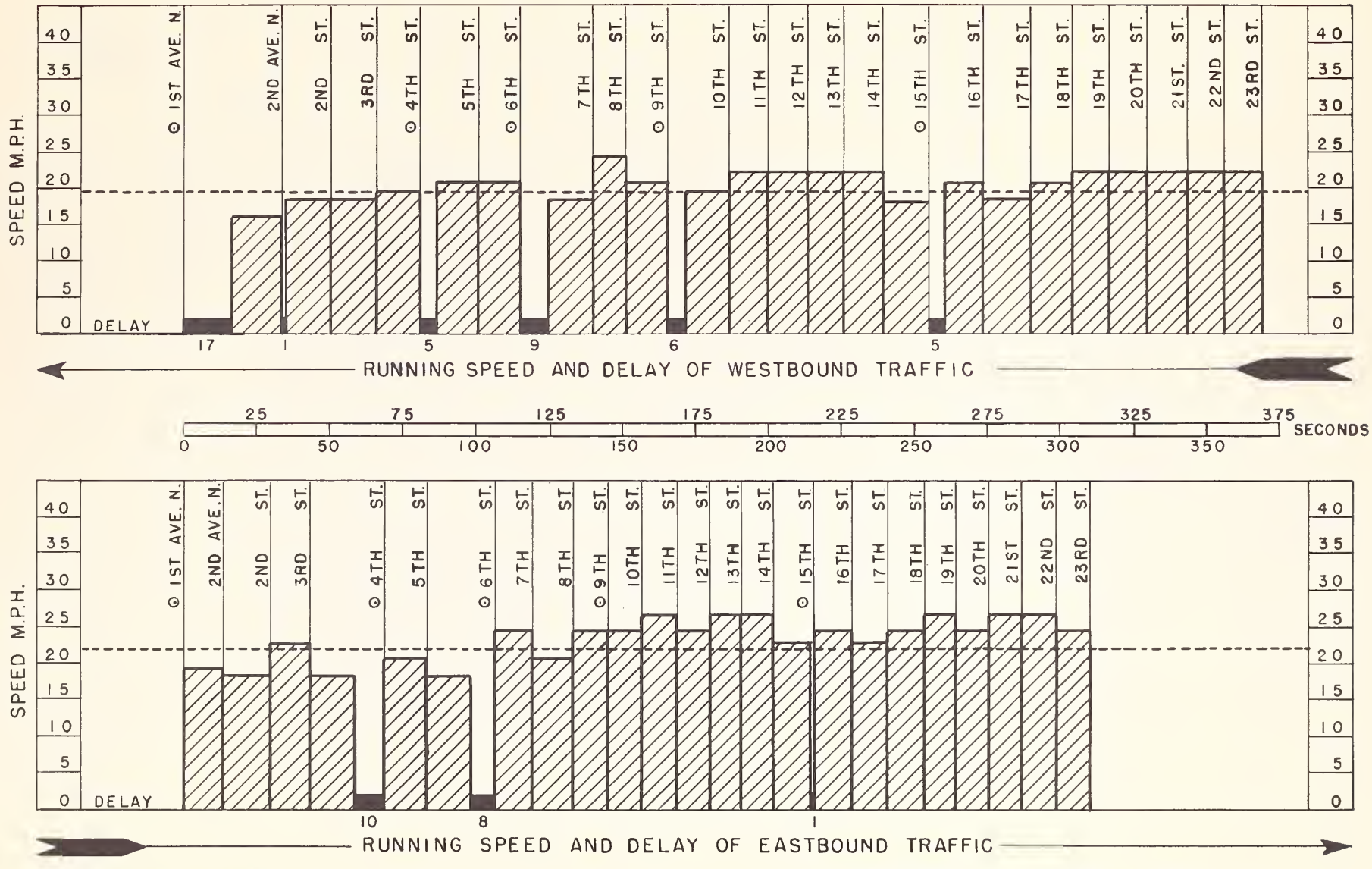
SUMMARY OF PEAK HOUR

	WESTBOUND	EASTBOUND
TOTAL RUNNING TIME	8 MIN. 53 SEC.	8 MIN. 32 SEC.
TOTAL STANDING DELAY	1 MIN. 33 SEC.	37 SEC.
AVERAGE OVERALL SPEED	17.8 M.P.H.	20.3 M.P.H.

PLATE 56

GREAT FALLS TRAFFIC SURVEY
OFF-PEAK HOUR - SPEED AND DELAY
PARK DRIVE AND 2ND AVE. N. FROM 1ST AVE. N. TO 38TH ST.

3.09 MILES



AVERAGE RUNNING SPEED

AVERAGE OVERALL SPEED

AVERAGE STOPPING DELAY

2 SECONDS

⊙ SIGNALS

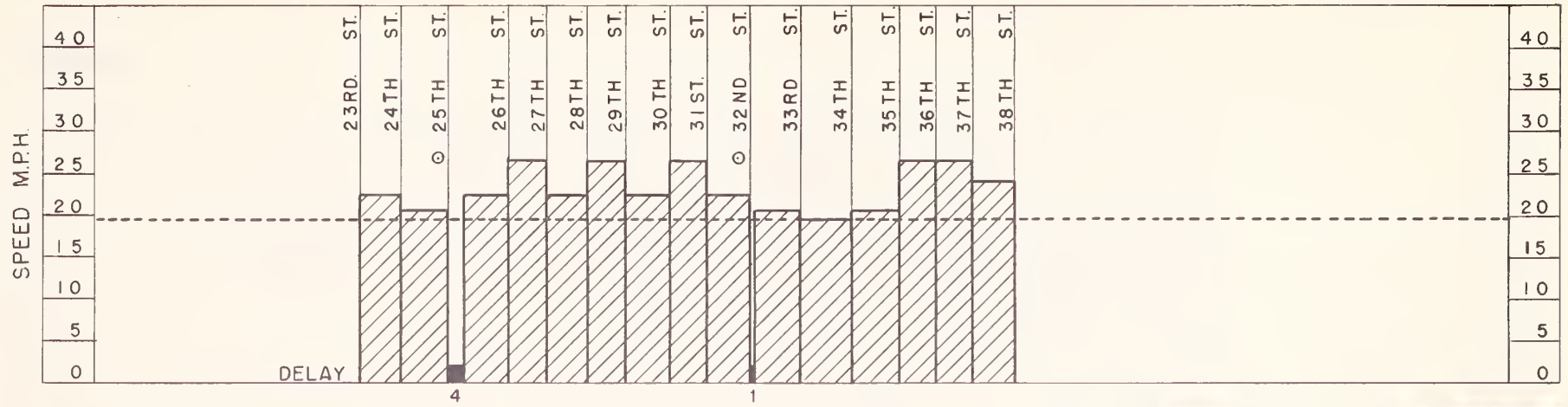
SUMMARY OF OFF PEAK HOUR

	WESTBOUND	EASTBOUND
TOTAL RUNNING TIME	8 MIN. 35 SEC.	7 MIN. 59 SEC.
TOTAL STANDING DELAY	48 SEC.	34 SEC.
AVERAGE OVERALL SPEED	19.8 M.P.H.	21.7 M.P.H.

PLATE 57

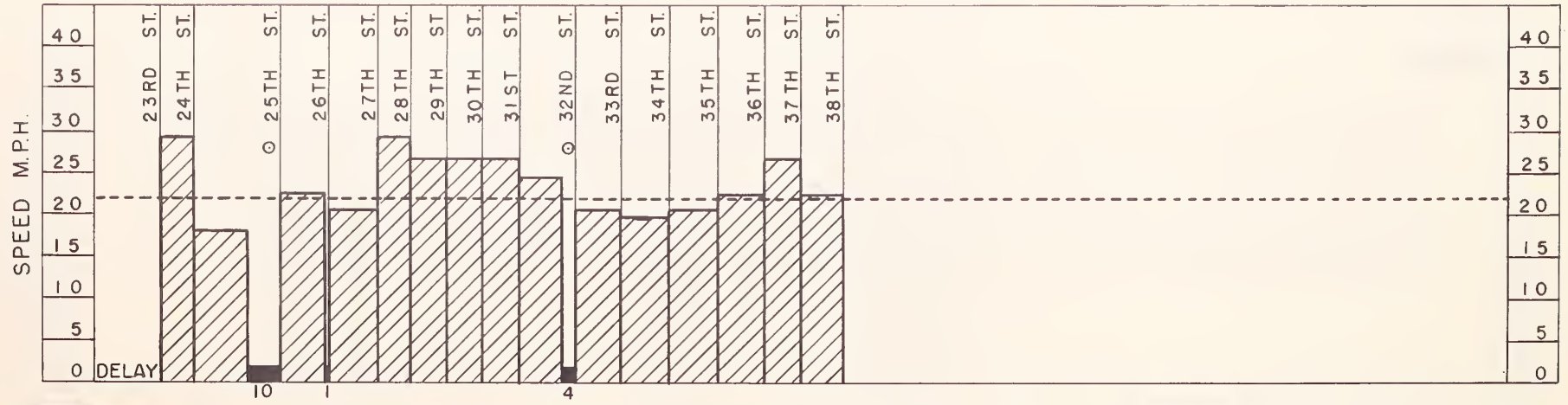
GREAT FALLS TRAFFIC SURVEY
OFF-PEAK HOUR - SPEED AND DELAY
PARK DRIVE AND 2ND AVE. N. FROM 1ST. AVE. N. TO 38TH ST.

3.09 MILES



RUNNING SPEED AND DELAY OF WESTBOUND TRAFFIC

325 375 425 475 525 575 625
300 350 400 450 500 550 600
SECONDS



RUNNING SPEED AND DELAY OF EASTBOUND TRAFFIC

AVERAGE RUNNING SPEED

AVERAGE OVERALL SPEED

2 AVERAGE STOPPING DELAY SECONDS

⊙ SIGNALS

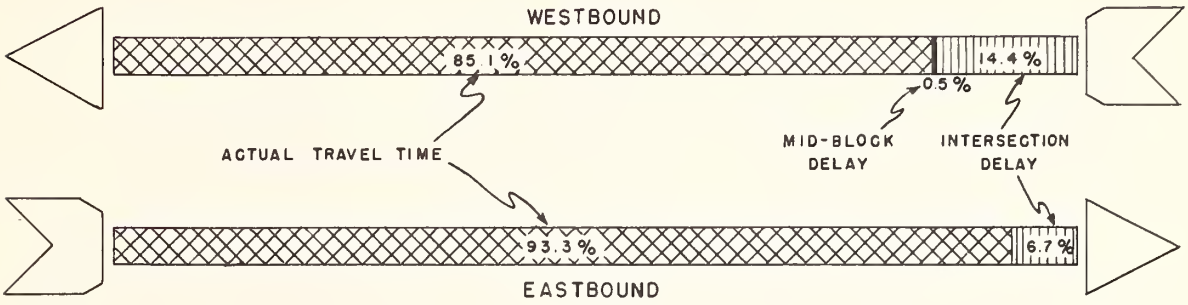
SUMMARY OF OFF-PEAK HOUR

	WESTBOUND	EASTBOUND
TOTAL RUNNING TIME	8 MIN. 35 SEC.	7 MIN. 59 SEC.
TOTAL STANDING DELAY	48 SEC.	34 SEC.
AVERAGE OVERALL SPEED	19.6 M.P.H.	21.7 M.P.H.

PLATE 58

GREAT FALLS TRAFFIC SURVEY
PEAK HOUR - SPEED AND DELAY
2ND AVE. N. FROM PARK DRIVE AND 1ST AVE. N. TO 38TH ST.

PER CENT TRAVEL TIME



	OFF-PEAK HOUR		PEAK HOUR	
	WESTBOUND	EASTBOUND	WESTBOUND	EASTBOUND
AVERAGE OVERALL DRIVING TIME	9 MIN. 23 SEC.	8 MIN. 33 SEC.	10 MIN. 26 SEC.	9 MIN. 9 SEC.
AVERAGE OVERALL SPEED	19.8 M.P.H.	21.7 M.P.H.	17.8 M.P.H.	20.3 M.P.H.
AVERAGE TRAVELING SPEED	21.6 M.P.H.	23.2 M.P.H.	20.9 M.P.H.	21.7 M.P.H.

PER CENT DELAY

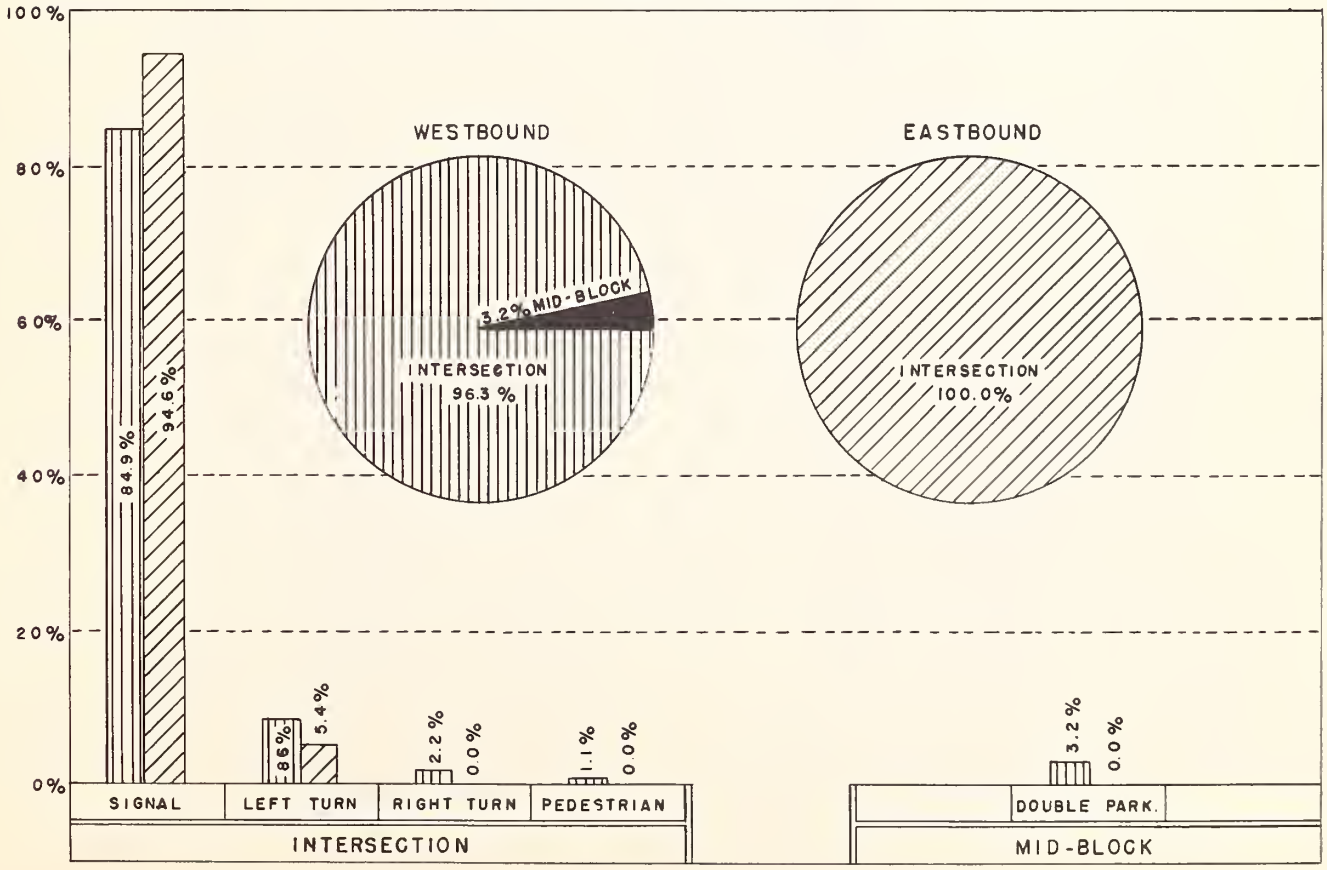
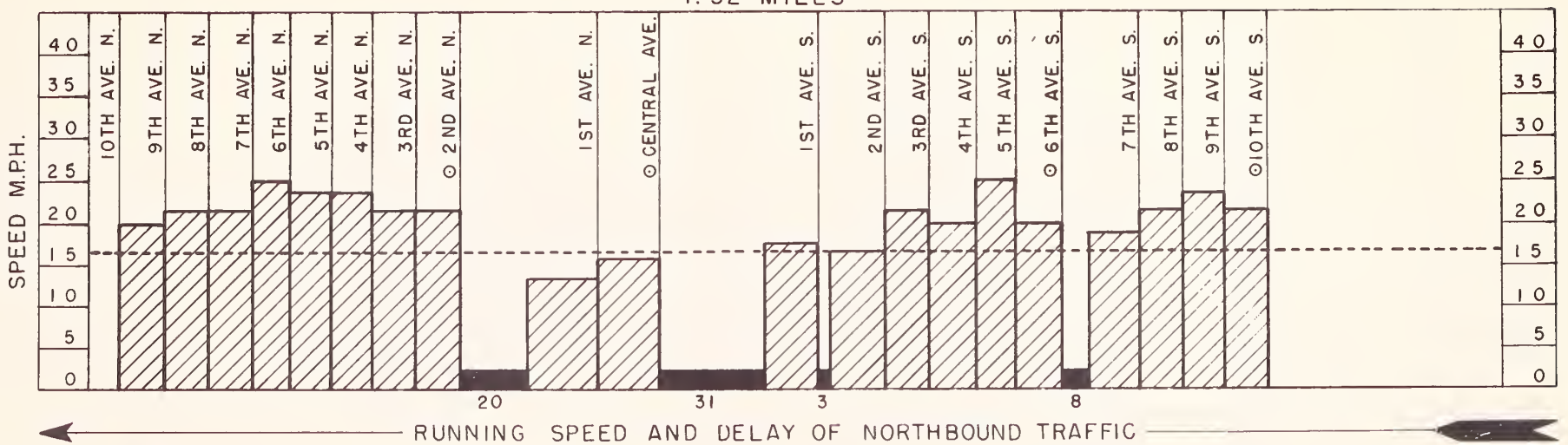
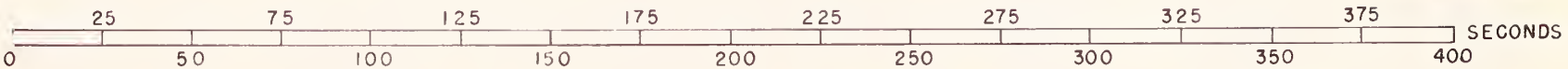


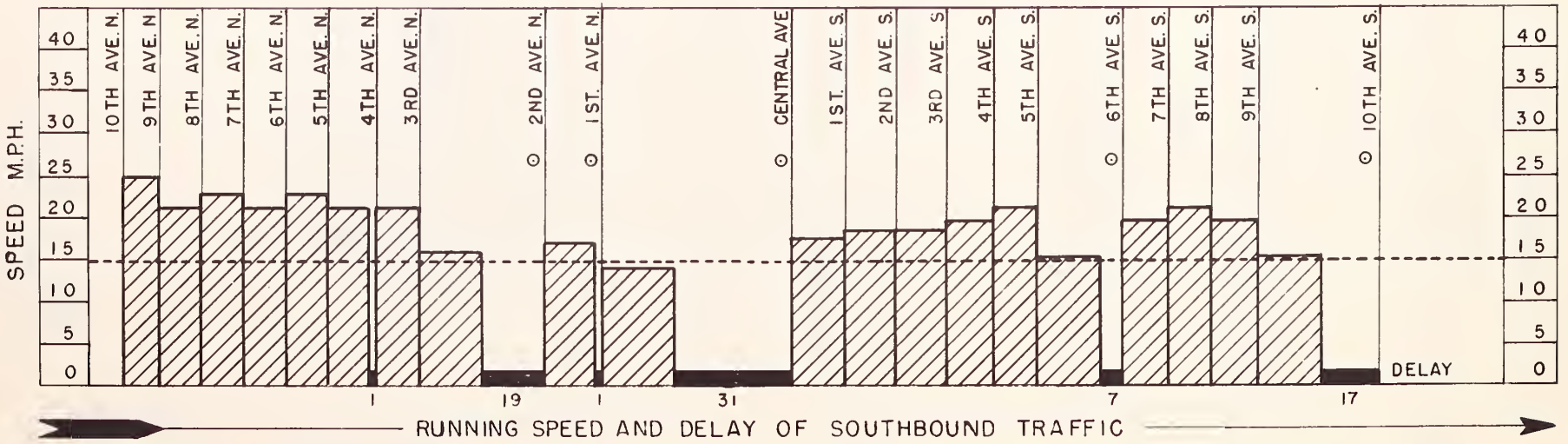
PLATE 59

GREAT FALLS TRAFFIC SURVEY
PEAK HOUR - SPEED AND DELAY
9TH ST. BETWEEN 10TH AVE. N. AND 10TH AVE. S.

1.52 MILES







AVERAGE RUNNING SPEED

AVERAGE OVERALL SPEED

AVERAGE STOPPING DELAY

2 SECONDS

⊙ SIGNALS

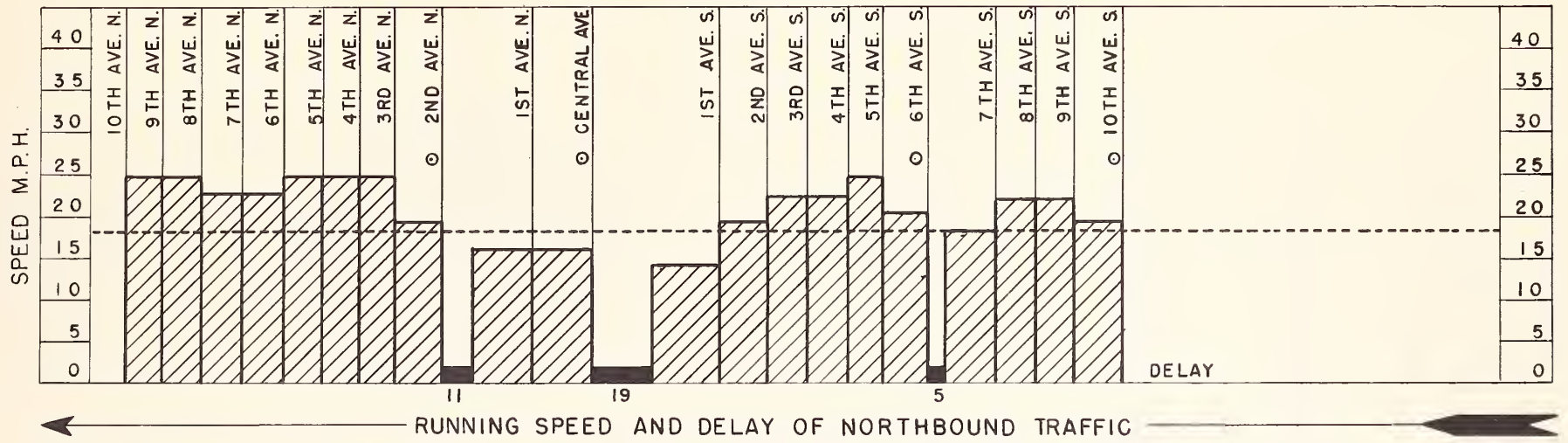
SUMMARY OF PEAK HOUR

	NORTHBOUND	SOUTHBOUND
TOTAL RUNNING TIME	4 MIN. 35 SEC.	4 MIN. 51 SEC.
TOTAL STOPPING DELAY	1 MIN. 5 SEC.	1 MIN. 21 SEC.
AVERAGE OVERALL SPEED	16.1 M.P.H.	14.7 M.P.H.

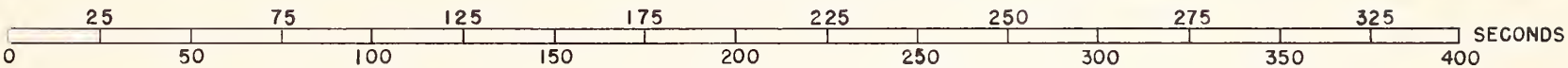
PLATE 60

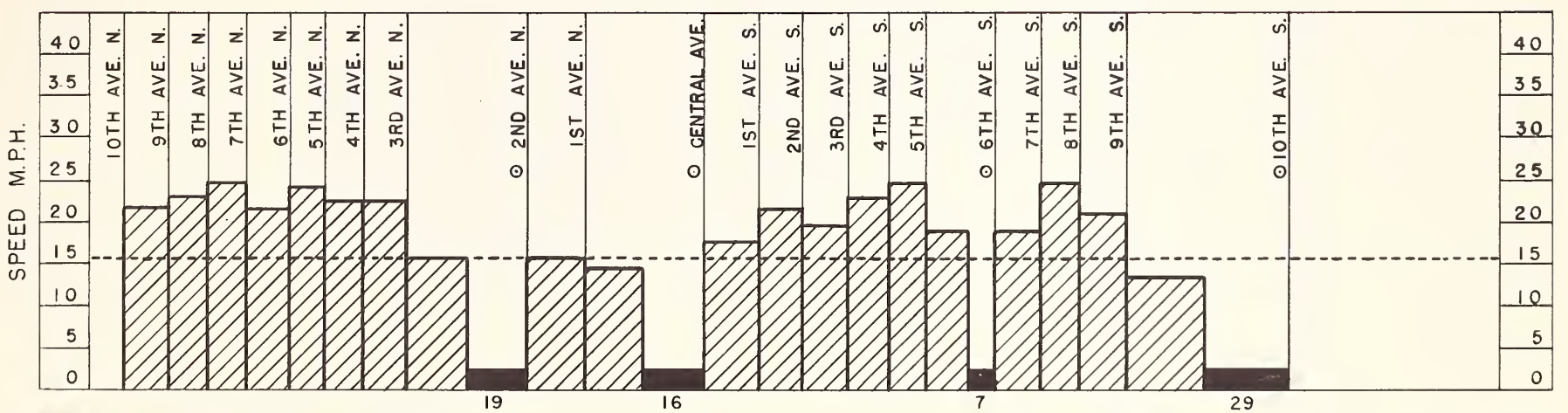
GREAT FALLS TRAFFIC SURVEY
OFF-PEAK HOUR - SPEED AND DELAY
9TH ST. BETWEEN 10TH AVE. N. AND 10TH AVE. S.

1.52 MILES



RUNNING SPEED AND DELAY OF NORTHBOUND TRAFFIC





RUNNING SPEED AND DELAY OF SOUTHBOUND TRAFFIC

AVERAGE RUNNING SPEED

AVERAGE OVERALL SPEED

AVERAGE STOPPING DELAY

2 SECONDS

⊙ SIGNALS

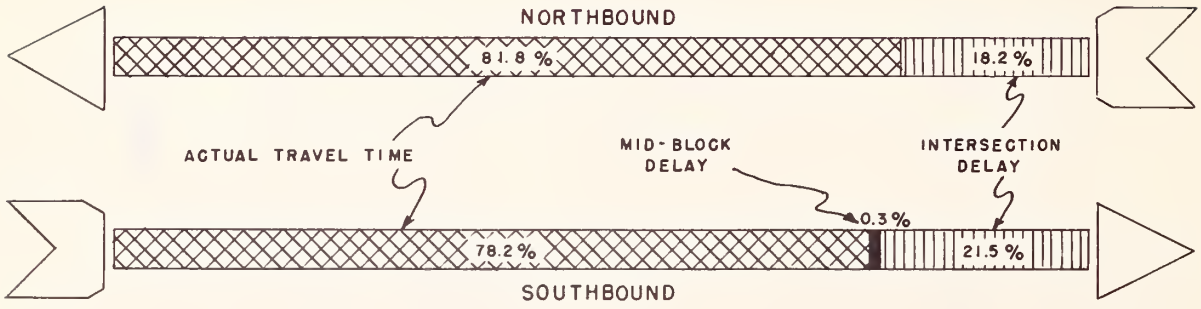
SUMMARY OF OFF-PEAK HOUR

	NORTHBOUND	SOUTHBOUND
TOTAL RUNNING TIME	4 MIN. 21 SEC.	4 MIN. 35 SEC.
TOTAL STOPPING DELAY	35 SEC.	1 MIN. 11 SEC.
AVERAGE OVERALL SPEED	18.5 M.P.H.	15.8 M.P.H.

PLATE 61

GREAT FALLS TRAFFIC SURVEY
PEAK HOUR - SPEED AND DELAY
9TH ST. FROM 10TH AVE. S. TO 10TH AVE. N.

PER CENT TRAVEL TIME



	OFF-PEAK HOUR		PEAK HOUR	
	NORTHBOUND	SOUTHBOUND	NORTHBOUND	SOUTHBOUND
AVERAGE OVERALL DRIVING TIME	4 MIN. 56 SEC.	5 MIN. 46 SEC.	5 MIN. 40 SEC.	6 MIN. 12 SEC.
AVERAGE OVERALL SPEED	18.5 M.P.H.	15.8 M.P.H.	16.1 M.P.H.	14.7 M.P.H.
AVERAGE TRAVELING SPEED	20.9 M.P.H.	19.9 M.P.H.	19.6 M.P.H.	18.8 M.P.H.

PER CENT DELAY

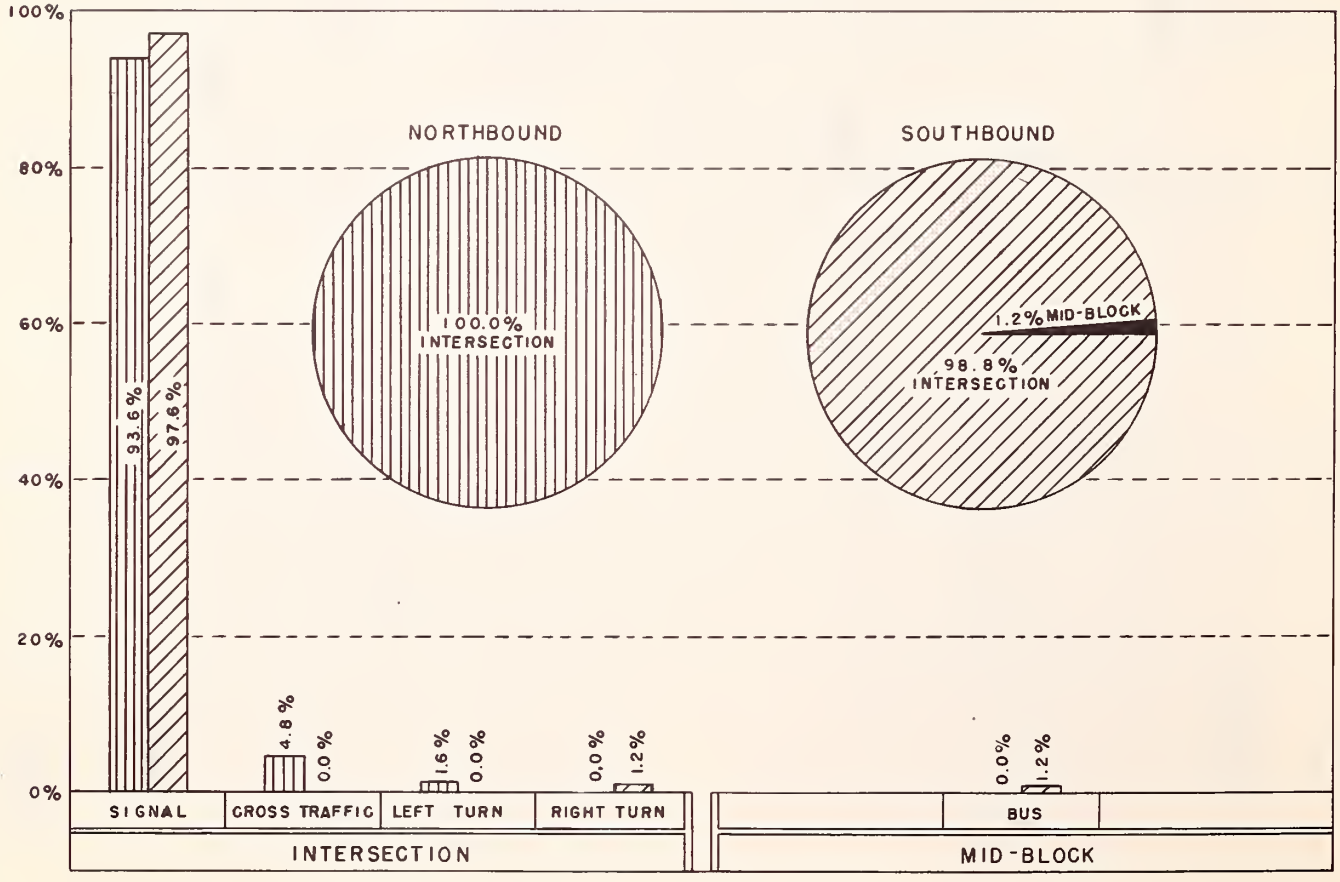


PLATE 62

A D D E N D A

ADDENDA

PUBLIC TRANSIT SYSTEM

Great Falls is fortunate in having an excellent public transit system which serves most sections of the city. In the event that the recommendations concerning the one-way operation of First and Second Avenues North are put into effect, some disruption of the bus service on these avenues might develop. It is therefore suggested that a study of the bus service and schedules on these avenues be made prior to placing them in one-way operation.

While the peak hour volume counts were being taken on Central Avenue, it was noted that busses were piling up in loading zones designed for one vehicle. While one bus was parked properly in a zone, loading or discharging passengers, a second bus, in some instances, would attempt to use the same zone, with the result that the driver would be forced to double-park or park at an angle. This practice is the cause of some congestion and could result in traffic accidents. In order to correct this condition, it is suggested that the bus schedule on Central Avenue be revised to permit more headway between busses during peak hours.

THE OFFICE OF TRAFFIC ENGINEER

The President's Highway Safety Conference of 1952 approved the following recommendations concerning establishing the office of Traffic Engineer in cities:

1. In cities having between 50,000 and 100,000 population, at least one full time Traffic Engineer should be employed and vested with sufficient authority to insure the adoption of appropriate engineering measures for traffic operation and safety.
2. In cities having less than 50,000 population, an engineer should be employed--preferably the Director of Public Works, the City Engineer, or some member of his staff--with qualifications and experience necessary to perform the functions of Traffic Engineer.

In view of the fact that Great Falls with its environs was listed as having a population of over 45,000 in the 1950 census, it is suggested that some consideration be given to establishing the office of Traffic Engineer.

The following functions should be under the jurisdiction and authority of a

Traffic Engineer:

TRAFFIC OPERATION

1. Traffic control devices--determine need, establish standards, specifications and warrants, and program improvements.
2. Design and time traffic control signals and supervise their erection and maintenance.
3. Study need for, design, and schedule pavement and curb markings.
4. Design and determine specifications, and maintain traffic signs and related devices.
5. Determine and establish bus stops, loading zones, detours, and other street use regulations.
6. Review and pass upon permits for curb cuts, driveways, parking lots, and other matters affecting traffic operation.
7. Develop standards and warrants for street lighting, plan and program improvements, supervise installations, and perform all allied functions.
8. Co-ordinate work with police departments for effective enforcement.
9. Establish one-way streets, through-streets, turning controls, curb parking regulations, bus and truck routes, and other operational procedures.
10. Co-operate with the City Engineer and the City Planning Director in the review and approval of all street improvements and extensions.

TRAFFIC PLANNING AND RESEARCH

1. Plan, lay out, and execute field studies such as traffic volumes, traffic movements, cordon counts, parking, speed and delay, origin and destination, efficiency comparisons, capacity, etc., of city-wide importance to traffic planning.
2. Analyze field data and prepare reports.
3. Analyze accident records of hazardous locations and prepare spot maps, collision and condition diagrams, and design corrective measures.

4. Prepare suggested geometric designs for streets and intersections, channelization, driveways, etc.
5. Prepare plans for traffic routing, one-way streets, turn controls, curb and off-street parking and other major remedial measures.
6. Assist and advise with other official agencies responsible for planning and constructing traffic facilities.